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FUR SEAL INVESTIGATIONS PRIBILOF ISLANDS, ALASKA, 1964

by Alton Y. Roppel, Ancel M. Johnson,

Raymond E. Anas, and Douglas G. Chapman

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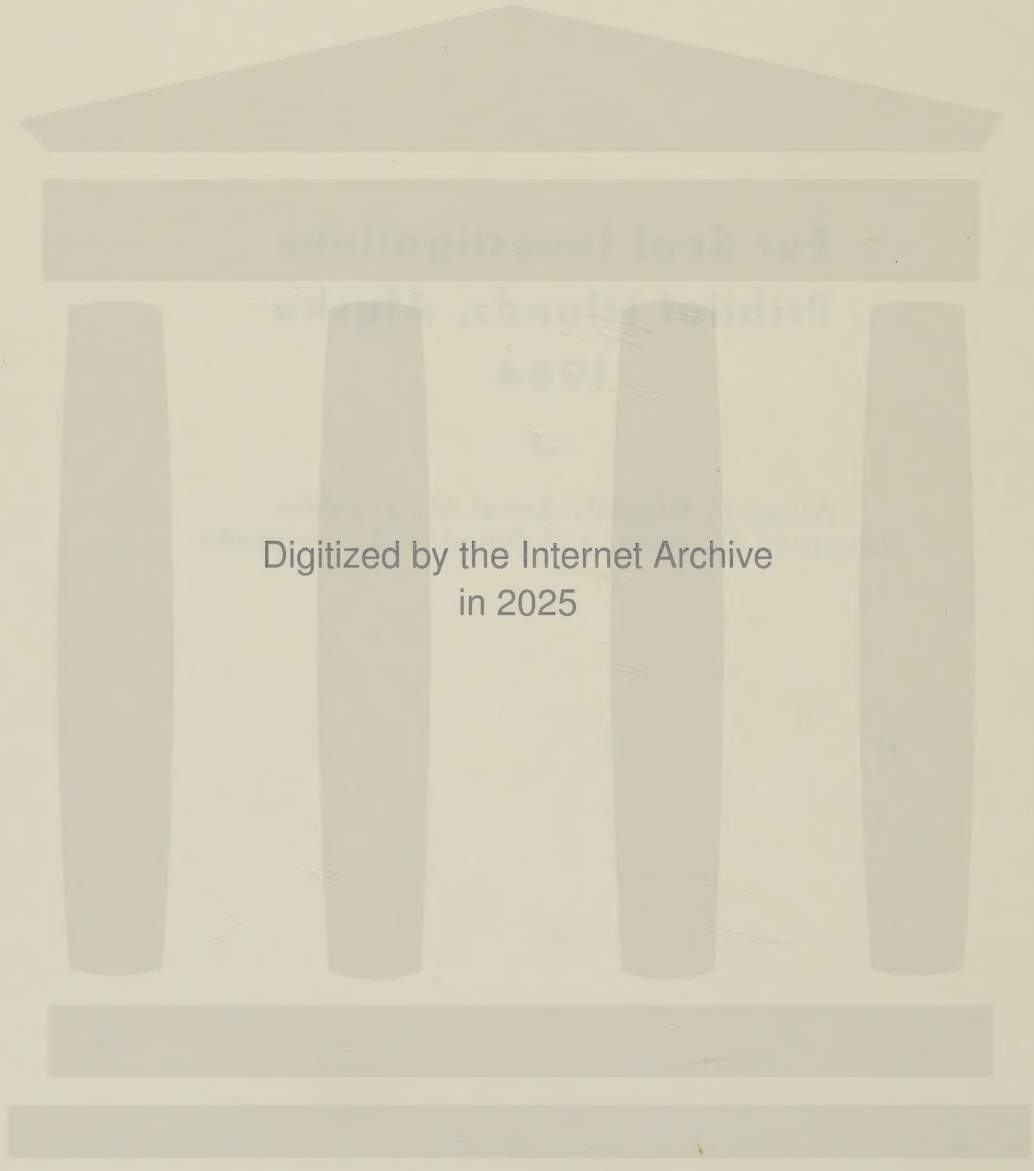

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Fur Seal Investigations Pribilof Islands, Alaska, 1964

by

Alton Y. Roppel, Ancel M. Johnson,
Raymond E. Anas, and Douglas G. Chapman

ABSTRACT

A total of 48,980 male seals were killed on the Pribilof Islands in 1964. Age classification in percent was: 8, 60, 27, and 5, ages 2-5. The peak of the kill occurred 27-31 July. Predicted kills of 3- and 4-year-old males on St. Paul Island by 5 August were 24,000 and 13,000; actual kills were 22,203 and 10,509. Harem and idle bull counts were 11,074 and 8,584. Of 16,452 female seals killed, 72 percent were in ages 2-5 and 28 percent were age 6 and older. Of 147 3-year-old females examined, all were nulliparous; 3 of 73 4-year-old females were primiparous and post partum. Recoveries of seals marked as pups included 4,205 with tags and 1,890 with checkmarks only. A total of 302 seals selected and tagged as yearlings in previous years and 45 Soviet-tagged seals were killed. A total of 24,991 pups were tagged and checkmarked. Surveys of yearlings tagged as pups in 1963 were made to provide an index to survival from birth to age 1. Land pup mortality was 25,042. From 4-year-old male tag recoveries, there were an estimated 614,580 pups alive at the time of tagging in 1960. From 3-year-old male tag recoveries, there were 494,724 pups in 1961. Pup populations estimated from female data were 604,546 for 1960 and 473,131 for 1961. Recoveries of seals tagged as yearlings indicated that 80,211 male seals of the 1961 year class survived to age 1. Marked to unmarked ratios yielded an estimate of 353,000 pups born on the Pribilof Islands in 1964. Total counts of live pups on some rookeries supported this estimate. Tagged male and female pups weighed 1.10 and 0.92 kilograms less than untagged males and females. A total of 1,077 skins from males and females were collected for experimental use in relating economic value to age and sex. The predicted male kill as of 5 August 1965 is 4,000 ages 2 and 5, 33,000 age 3, and 16,000 age 4.

INTRODUCTION

Complete protection of female seals was one of the principles followed in restoring the reduced Pribilof seal population, after signing of the Fur Seal Convention of 1911. The steady growth of the population from 1911 to about 1940 illustrated the effectiveness of this principle. After 1940 the failure of the kill of males and the number of harem bulls to increase raised doubts about the population figures in use and the wisdom of continuing current management methods indefinitely. The first of continuing population studies (Kenyon, Scheffer, and Chapman, 1954) demonstrated that the Pribilof population was far smaller than had been calculated from a constant increase percentage. The decreased growth rate suggested that the seal population was being restrained by one or more unknown factors of its environment. A logical succeeding step was a recommendation that some females be killed since they did not contribute to an increased population size or kill. Time was needed to bring about this abrupt change in the traditional standards for killing seals. The first change was made in 1954 when all females found in the round-up of males were purposely killed. Surprisingly, only 540 females were taken by the end of the male kill on 27 July, about 300 more than were usually taken accidentally with males.

The plan to take females was developed further in 1955 by discussions of U.S. and Japanese

Note.--Alton Y. Roppel and Ancel M. Johnson, Wildlife Biologists (Research), and Raymond E. Anas, Fishery Biologist (Research), Bureau of Commercial Fisheries Marine Mammal Biological Laboratory, U.S. Fish and Wildlife Service, Seattle, Wash.; and Douglas G. Chapman, Laboratory of Statistical Research, University of Washington, Seattle, Wash.

statisticians at the conference to negotiate a new fur seal convention. Some assumptions used in preparing a plan of action were:

1. The number of females in the Pribilof population was greater than needed to provide a maximum sustained yield, and unless reduced the population would begin to exhibit more drastic fluctuations.
2. After reduction of the population to a calculated sustained yield point, some females would be available in the harvest each year.
3. Improvement in the productivity of the population could be measured most quickly by observing the change in land mortality of pups and in the pregnancy rate of females. It would also be observed later in the number of returning seals.

By fall of 1963, population estimates, supplemented by observation of the reduced area of some rookeries and the fewer females on hauling grounds and rookery fringes, indicated that the number of females was sufficiently reduced. Both killing and natural mortality contributed to the lower population.

Beginning in 1964 the number of females to be taken is the surplus recruitment. This is determined by calculation and by availability.

The period of reduction was more extended than was desirable and the total amount of reduction was made less clear by fluctuating natural mortality. Methods of estimating populations and monitoring mortality and reproduction have been improved or made more specific. There is evidence now that the population level was lower than calculated when the experiment was planned.

As it enters its second phase, the experiment promises to have interesting and useful results even if the economic return from the fur seals is not increased. Results, such as lower population estimates and reduced land mortality, are beginning to accumulate, but it is too early to show how these changes are related to reduction of the population. The manipulation of seal numbers required by the experiment is capable of producing concrete evidence on which sound management principles can be based.

The 1964 field season on the Pribilof Islands extended from June to October. Arrivals, departures, and affiliations of research workers follows:

Name	Arrival	Departure	Affiliation	Work
Alton Y. Roppel	22 June	31 Aug.	Bureau of Commercial Fisheries	Fur seal research, general
Raymond E. Anas	1 July	" "	"	"
Robert L. DeLong[1]	" "	8 Sept.	"	"
Willard L. Fairbanks[1]	6 "	31 Aug.	"	"
Leland P. Glenn[1]	" "	14 Sept.	"	"
Mark C. Keyes	" "	24 Aug.	"	"
Charles A. Rohrmann[1]	" "	" "	"	"
Ancel M. Johnson	15 "	17 "	"	"
Ford Wilke	17 Aug.	28 Sept.	"	"
Dennis Bordukofsky[1]	-	-	St. Paul Island resident	"
David Galaktionoff[1]	-	-	"	"
Patrick Kozloff[1]	-	-	"	"
Agafon Krukoff, Jr.[1]	-	-	"	"
Benny Misiken[1]	-	-	"	"
Lavrenty Stepetin[1]	-	-	"	"
Innokenty C. Lestenkof[1]	-	-	St. George Island resident	"
Herman Lestenkof[1]	-	-	"	"
Dimitri Philemonof[1]	-	-	"	"
Max Thompson	6 July	8 Sept.	Smithsonian Institution	Bird banding
Vin Holman	" "	" "	"	"

[1]Temporary employee.

Shoichi Tanaka spent the period from 20 July to 10 August on the Pribilof Islands observing fur seal research, seal killing, and skin processing. Tanaka represents the Government of Japan, Tokai Regional Fisheries Research Laboratory. His visit was arranged under the provisions of the Interim Convention on Conservation of North Pacific Fur Seals.

Allison M. Craig and assistant Christopher Craig were on St. Paul Island 10-31 August conducting experiments on the effects of pituitary extracts of seals on the reproductive organs of captive female fur seal pups. Miss Craig represents the Government of Canada through the Fisheries Research Board of Canada. This body supports fur seal research at the University of British Columbia.

Roger Spencer, Professor of Veterinary Medicine at Washington State University, was on St. Paul Island from 28 July to 10 August. He assisted the staff veterinarian with studies of fur seal pathology and prepared an appraisal of seal mortality investigations.

POPULATION

Males

Age Classification.--The male seals killed on the Pribilof Islands in 1964 are classified by age in appendix tables 5, 6, 7, and 8. All available males from 42 inches, tip of nose to tip of tail, to those having a mane were included in the kill. The mane, a secondary sex characteristic composed of long silver-colored guard hairs on the neck, appears first on some 5-year-olds. At age 6, most males have a developing mane.

Age classification of the male kill was determined from a sample of 5,140 canine teeth collected on St. Paul Island and from 1,587 collected on St. George Island. Normally, 10 percent of the males killed are sampled for their canine teeth. The size of the tooth sample, however, is increased when the number of seals killed on a rookery from one drive is below certain levels. The following sampling schedule is used: 10 percent of a kill of 300 or more; 20 percent of 100 to 300; and 30 percent or more of 100 or fewer animals.

The minimum length limit of 42 inches was removed for 8 days beginning 17 July so that all available 2-year-old males could be taken. Though only a small proportion of this age class is on land in late July a complete kill of those that are available may provide information useful for forecasting the size of the 3-year-old kill the following year. Twenty percent of all the males killed were sampled for age and body length during the 8-day period.

The peak of the kill occurred during round 7 (27-31 July) when 6,550 males were taken on St. Paul Island (fig. 1). The percent cumulative kill, by date, age, and island is shown in figure 2.

Table 1 shows the kill of male seals by year class for the years 1947-62. Tables 2 and 3 illustrate the kill of 3- and 4-year-old male seals at various dates for 1954-64, and the cumulative numbers of males killed each year from 1955 to 1964, St. Paul Island.

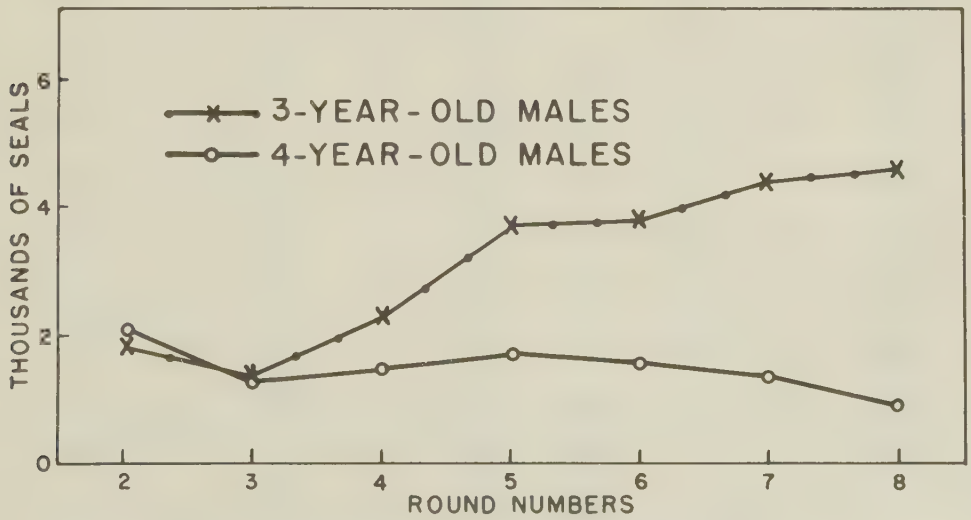

Figure 1.--Kill of male seals, by age and round, St. Paul Island, 1964.

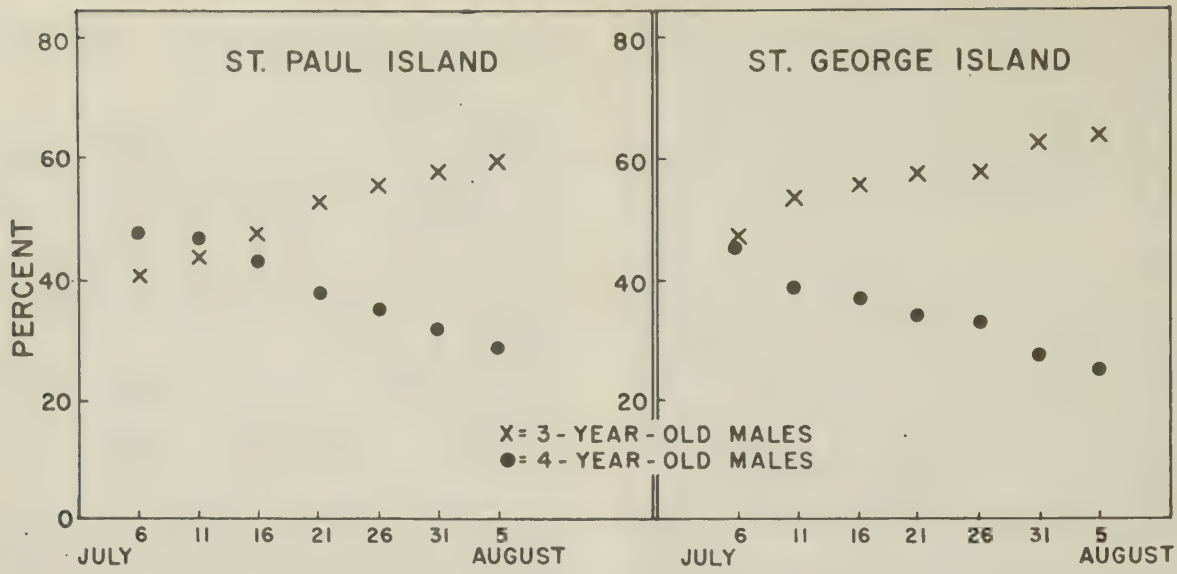

Figure 2.--Percent 3- and 4-year-old male seals in cumulative kill, by date, Pribilof Islands, Alaska, 1964.

Table 1.--Kill of male seals,[1] by year class, Pribilof Islands, Alaska, 1947-62

Year class	St. Paul Island Age when killed 2	3	4	5	Total	St. George Island Age when killed 2	3	4	5	Total	Grand total
1947	-	30,110	23,697	854	54,661	-	7,043	3,731	123	10,897	65,558
1948	486	25,714	19,995	103	46,298	114	5,546	3,926	22	9,608	55,906
1949	-	29,697	12,326	249	42,272	303	7,116	2,570	280	10,269	52,541
1950	855	40,656	15,365	332	57,208	1,104	8,475	4,793	147	14,519	71,727
1951	1,384	32,350	18,083	3,057	54,874	288	7,907	5,310	681	14,186	69,060
1952	1,735	30,733	31,410	675	64,553	545	8,998	8,459	506	18,508	83,061
1953	839	38,312	8,855	54	48,060	295	10,611	3,330	100	14,336	62,396
1954	2,918	23,473	5,599	554	32,544	535	6,651	2,779	162	10,127	42,671
1955	1,015	27,863	10,555	115	39,548	555	7,246	2,825	260	10,886	50,434
1956	885	10,671	2,762	532	14,850	171	2,251	1,387	218	4,027	18,877
1957	2,590	24,283	15,344	773	42,990	242	5,098	4,492	244	10,076	53,066
1958	1,977	48,458	14,149	1,587	66,171	431	9,413	3,707	540	14,091	80,262
1959	2,820	26,456	14,184	1,764	45,224	891	5,890	4,690	492	11,963	57,187
1960[2]	1,619	14,310	10,533	-	26,462	636	4,332	2,579	-	7,547	34,009
1961[2]	1,098	22,468	-	-	23,566	921	6,948	-	-	7,869	31,435
1962[2]	2,539	-	-	-	2,539	1,139	-	-	-	1,139	3,678

[1] Includes only age 2- to 5-year-old seals killed in the Pribilof Islands.
[2] Incomplete returns.

Table 2.--Kill of 3- and 4-year-old male seals at various dates, St. Paul Island, 1954-64

Date		Kill level	Age in years	
			3	4
			Percent	Percent
1954	4 July	10,000	44	54
	11 "	20,000	49	49
	18 "	30,000	56	41
	27 "	49,699	65	31
1955	9 "	10,000	50	48
	16 "	20,000	53	46
	22 "	30,000	56	42
	31 "	49,977	62	36
1956	6 "	10,000	24	64
	11 "	20,000	30	62
	16 "	30,000	33	60
	26 "	50,000	41	52
	15 Aug.	75,736	51	42
1957	13 July	10,000	53	41
	24 "	20,000	63	33
	5 Aug.	30,000	67	28
	10 "	34,055	69	26
1958	10 July	10,000	74	26
	18 "	20,000	78	22
	28 "	30,000	80	19
	31 "	33,325	82	17
1959	14 "	10,000	38	57
	27 "	20,000	45	50
	31 "	22,286	46	47
1960	21 "	10,000	80	17
	1 Aug.	20,000	83	12
	7 "	28,819	84	10
1961	9 July	10,000	61	37
	18 "	20,000	62	37
	24 "	30,000	66	32
	2 Aug.	50,000	70	27
	15 "	67,169	72	23
1962	12 July	10,000	49	47
	20 "	20,000	54	42
	26 "	30,000	59	37
	5 Aug.	39,983	62	34
1963	16 July	10,000	33	59
	25 "	20,000	43	50
	5 Aug.	30,000	47	46
1964	15 July	10,000	48	43
	24 "	20,000	55	36
	2 Aug.	30,000	59	31
	5 "	32,712	60	29

Table 3.--Cumulative number of male seals killed, St. Paul Island, 1955-64[1]

Date		Age in years 3	4	Date		Age in years 3	4
1955:	1 July	1,574	1,962	1960:	1 July	699	368
	6 "	3,341	3,643		6 "	1,751	676
	11 "	5,929	6,248		11 "	3,274	988
	16 "	10,416	8,999		16 "	5,529	1,385
	21 "	15,358	11,648		21 "	7,904	1,717
	26 "	21,707	15,638		26 "	10,978	1,968
	31 "	30,733	18,083		31 "	15,312	2,347
					5 Aug.	21,610	2,657
					10 "	24,201	2,757
1956:	1 July	1,079	3,056	1961:	6 July	4,119	2,315
	6 "	2,671	7,060		11 "	6,770	4,316
	11 "	6,145	12,677		16 "	9,993	6,021
	16 "	9,808	17,954		21 "	15,492	8,302
	21 "	14,589	22,159		26 "	22,609	10,851
	26 "	20,726	25,999		31 "	29,523	12,488
	31 "	26,590	28,560		5 Aug.	38,908	14,072
	5 Aug.	31,701	29,853		10 "	43,629	14,780
	10 "	35,502	30,663		15 "	48,458	15,344
	15 "	38,290	31,448				
1957:	1 July	1,360	1,071	1962:	6 July	1,639	2,028
	6 "	2,994	2,161		11 "	4,485	4,335
	11 "	4,507	3,296		16 "	7,643	6,636
	16 "	6,777	4,651		21 "	11,226	8,663
	21 "	9,380	5,602		26 "	17,301	10,832
	26 "	13,350	6,784		31 "	20,267	12,047
	31 "	16,804	7,547		5 Aug.	25,098	13,422
	5 Aug.	19,823	8,196				
	10 "	23,473	8,855				
1958:	1 July	1,991	732	1963:	6 July	1,381	2,668
	6 "	3,988	1,383		11 "	2,498	4,331
	11 "	8,038	2,658		16 "	3,155	5,531
	16 "	12,917	3,912		21 "	6,047	7,882
	21 "	17,688	4,839		26 "	8,915	10,373
	26 "	22,661	5,279		31 "	11,596	12,283
	31 "	27,216	5,556		5 Aug.	13,954	13,791
1959:	1 July	584	1,474	1964:	6 July	1,819	2,095
	6 "	1,364	3,028		11 "	3,266	3,482
	11 "	2,625	4,665		16 "	5,619	4,968
	16 "	4,189	6,425		21 "	9,333	6,710
	21 "	6,096	7,949		26 "	13,188	8,279
	26 "	8,327	9,721		31 "	17,607	9,624
	31 "	10,203	10,446		5 Aug.	22,203	10,509

[1] Sealing began 2 July in 1961, 1962, and 1963; 1 July in 1964; 27 June all other years.

1955 male kill ended 31 July
1956 " " " 15 Aug.
1957 " " " 10 "
1958 " " " 31 July
1959 male kill ended 31 July
1960 " " " 7 Aug.
1961 " " " 15 "
1962 " " " 5 "
1963 male kill ended 5 August
1964 " " "

Bull Counts.--Harem and idle bulls decreased for the third successive year. The 1964 bull counts by island and by rookery are given in table 4, and all bull counts since 1911 are presented in appendix table 9.

Harem bulls on St. Paul Island decreased by 1.4 percent of the 1963 count; those on St. George Island decreased by 4.0 percent. The magnitude of the percent decrease from 1963 to 1964 was less than that from 1962 to 1963 when St. Paul Island had 10.9 percent fewer and St. George had 11.6 percent fewer harem bulls. The total number of harem bulls on the Pribilof Islands was 98 percent of the 1963 count.

The idle bulls on St. Paul Island decreased 7.3 percent from 1963; those on St. George Island decreased by 21.2 percent. The magnitude of the percent decrease was also less than that for the 1962-63 counts when St. Paul Island had 16.0 percent fewer and St. George Island had 28.7 percent fewer idle bulls. The total number of idle bulls on the Pribilof Islands was 90 percent of the 1963 count.

Table 4.--Harem and idle bull count, by rookery, Pribilof Islands, Alaska, 1964

Date	Rookery	Bulls		
		Harem	Idle	Total
	St. Paul Island			
10 July	Gorbatch	764	561	1,325
	Ardiguen	100	70	170
	Reef	1,301	756	2,057
	Total	2,165	1,387	3,552
11 July	Polovina	244	455	699
	Polovina Cliffs	727	482	1,209
	Little Polovina	275	339	614
	Total	1,246	1,276	2,522
12 July	Morjovi	708	866	1,574
	Vostochni	1,523	1,232	2,755
	Total	2,231	2,098	4,329
13 July	Tolstoi	920	508	1,428
	Lukanin	221	94	315
	Kitovi	492	152	644
	Total	1,633	754	2,387
14 July	Zapadni	1,039	1,061	2,100
	Little Zapadni	559	349	908
	Zapadni Reef	212	170	382
	Total	1,810	1,580	3,390
St. Paul Island total		9,085	7,095	16,180
	St. George Island			
15 July	Staraya Artil	294	340	634
15 July	East Reef	150	133	283
	East Cliffs	225	82	307
	Total	375	215	590
15 July	Zapadni	307	316	623
	South	257	82	339
	Total	564	398	962
17 July	North	756	536	1,292
St. George Island total		1,989	1,489	3,478
Pribilof Islands total		11,074	8,584	19,658

Females

Age Classification.--The female seals killed on the Pribilof Islands in 1964 are classified by age in appendix tables 10, 11, 12, and 13. Year class contributions to the female kills on the Pribilof Islands are given in table 5 for the years 1939-63. Table 6 shows the percent age composition of female seals sampled from the kills on the Pribilof Islands from 1958 to 1964.

Because the need to reduce the number of females has ended, most old females appearing in the drives in 1964 were allowed to escape. In general, only females having black or a mixture of black and white vibrissae were killed. Selection on this basis roughly restricts the kill of this sex to ages 2-5, or those having the highest quality skins. Most females 6 years old and older have white vibrissae.

The source of females killed on St. Paul Island in 1964 was noted, that is, whether from traditional male hauling grounds, rookery fringes, or from mixed areas. The age composition of females taken from these three areas is given in table 7. Behind some of the rookeries are areas on which few animals appear until August, or after the general breeding season. Because seals using these areas may be a mixture of animals from the rookery and from the hauling ground, they are classified as coming from a mixed area. As in 1963, there was little difference in the age composition of females taken from the three areas.

Reproduction.--The genital tracts from 147 3-year-old and 73 4-year-old females taken in the kill on St. Paul Island in 1964 were collected and preserved for a detailed study to be made later. A gross examination of the genital tracts revealed that none of the 3-year-old females had given birth to pups in 1964 or previously; three 4-year-old females were primiparous and post partum.

Soviet tagged females bearing tags M-13487, E-17100, and C-54750 (ages 2, 3, and 4,

Table 5. --Kill of female seals, by year class, 1/ Pribilof Islands, Alaska, 1939-63

Year class	Age in years									
	1	2	3	4	5	6	7	8	9	10
1939	-	-	-	-	-	-	-	-	-	17
1940	-	-	-	-	-	-	-	-	8	15
1941	-	-	-	-	-	-	-	16	7	15
1942	-	-	-	-	-	-	15	13	7	39
1943	-	-	-	-	-	12	8	10	41	36
1944	-	-	-	-	3	11	9	57	43	10
1945	-	-	-	4	4	8	45	43	11	27
1946	-	-	-	4	4	60	54	11	38	762
1947	-	1	-	1	37	84	46	48	1,136	1,773
1948	-	-	-	84	75	94	77	1,766	3,120	678
1949	-	-	30	34	161	118	2,155	3,550	559	1,173
1950	-	10	17	92	210	2,949	4,031	654	1,289	345
1951	4	-	8	85	4,618	6,343	1,328	1,958	492	2,292
1952	-	-	16	6,422	11,465	3,408	3,515	526	3,127	1,687
1953	-	1	2,132	5,806	4,056	2,958	493	2,843	2,247	87
1954	-	132	1,150	8,493	3,771	683	3,057	2,809	68	51
1955	-	11	11,468	7,285	1,047	4,810	2,869	97	34	
1956	-	601	2,072	614	4,520	3,444	1,859	42		
1957	150	281	352	6,912	6,303	4,080	592			
1958	76	79	4,651	8,683	8,697	1,914				
1959	27	508	4,563	8,044	3,626					
1960	120	431	2,979	3,409						
1961	37	724	3,434							
1962	7	390								
1963	26									

1/ Includes pelagic research kill of the United States and Canada, 1958-64. In addition to the above kill, 50,438 females, 11 and older, 19,484 females, 8 and older, and 2,360 unclassified females, were taken.

Table 6.--Percent age composition of female seals sampled from the kills, Pribilof Islands, Alaska, 1958-64

Year and island	Age in years									
	2	3	4	5	6	7	8	9	10	10+
1958										
St. Paul	2	37	29	13	11	3	1	1	2	1
St. George	1	20	22	17	13	9	4	3	2	9
1959										
St. Paul	1	6	25	14	11	12	6	4	4	17
St. George	-	6	20	14	10	13	7	6	5	19
1960										
St. Paul	1	8	14	23	14	9	8	7	4	12
St. George	-	3	9	20	12	8	10	9	5	24
1961										
St. Paul	1	10	16	10	11	6	6	7	5	28
St. George	1	11	15	10	10	7	6	7	6	27
1962										
St. Paul										
July-August	1	14	26	15	6	5	4	3	3	23
September	-	2	9	13	10	9	10	8	4	35
St. George	1	12	24	14	8	5	5	3	3	25

	Age in years						
	2	3	4	5	6	7	8+
1963							
St. Paul							
July-August	1	5	18	21	10	4	41
September	3	7	14	17	8	5	46
St. George	2	10	23	18	10	4	33
1964							
St. Paul	3	21	22	23	13	4	14
St. George	2	29	24	28	10	2	5

Table 7.--Age classification of female seals in kill, by source, St. Paul Island, 1964

	Age						
	2	3	4	5	6	7	8+
			Hauling grounds				
Number	74	313	362	374	317	82	309
Percent	4	17	20	21	17	4	17
			Rookeries				
Number	111	1,321	1,346	1,311	696	241	719
Percent	2	23	23	23	12	4	13
			Mixed areas				
Number	81	605	679	777	433	109	491
Percent	3	19	21	25	14	3	15

respectively) were taken on St. Paul Island in 1964. The genital tracts of these females showed that all were nulliparous and that none had ovulated during the summer.

Tag Recoveries and Tagging

Tag Recoveries.--Except for a few tagged animals taken for experimental use, tagged male and female seals were not killed purposely, but rather, were taken only if they were within the limits described on pages 3 and 8 of this report.

A total of 4,205 tags were recovered from seals tagged as pups; 1,890 checkmarks from seals that had lost their tags were recorded. These data are summarized in table 8 by sex, age, and island, and are given in more detail in appendix table 14. The homing tendency of tagged male and female seals is shown in table 9 by age and in table 10 by rookery.

Table 8.--Summary of tagged and tag-lost seals recovered, by age and sex, Pribilof Islands, Alaska, 1964

Series	Age	Tagged seals			Tag-lost seals			Grand total
		St. Paul Island	St. George Island	Combined total	St. Paul Island[1]	St. George Island	Combined total	
	Years							
				1 July to 7 August				
				Males				
O	2	161	67	228	105	20	125	353
N	3	1,674	424	2,098	609	96	705	2,803
M	4	703	134	837	325	60	385	1,222
L	5	74	13	87	77	23	100	187
K	6	20	1	21	6	1	7	28
J	7	4	-	4	-	-	-	4
Total		2,636	639	3,275	1,122	200	1,322	4,597
				Females				
O	2	1	1	2	2	-	2	4
N	3	3	3	6	4	-	4	10
M	4	5	5	10	11	-	11	21
L	5	3	5	8	4	3	7	15
K	6	11	2	13	2	1	3	16
J	7	5	2	7	1	-	1	8
I	8	1	1	2	-	-	-	2
H	9	6	-	6	-	-	-	6
F	11	1	-	1	-	-	-	1
E	12	5	1	6	-	-	-	6
CS	15	1	-	1	-	-	-	1
B	16	3	-	3	-	-	-	3
Total		45	20	65	24	4	28	93
				14-28 August				
				Males				
O	2	49	45	94	23	10	33	127
N	3	34	25	59	13	4	17	76
M	4	3	7	10	1	8	9	19
L	5	1	1	2	-	3	3	5
K	6	2	-	2	-	1	1	3
J	7	1	-	1	-	-	-	1
Total		90	78	168	37	26	63	231
				Females				
O	2	18	13	31	70	7	77	108
N	3	142	66	208	127	18	145	353
M	4	142	42	184	125	20	145	329
L	5	94	28	122	91	15	106	228
K	6	82	9	91	-	3	3	94
J	7	25	2	27	-	1	1	28
I	8	6	-	6	-	-	-	6
H	9	11	-	11	-	-	-	11
G	10	5	-	5	-	-	-	5
F	11	2	-	2	-	-	-	2
E	12	8	-	8	-	-	-	8
D	13	1	-	1	-	-	-	1
B	16	1	-	1	-	-	-	1
Total		537	160	697	413	64	477	1,174

[1] Tag-lost recoveries on 17, 18, and 19 July are not included.

Table 9.--Homing tendency of male and female seals, by age, Pribilof Islands, Alaska, 1964

Males				Females			
Age	Total recoveries	Recovered home rookery		Age	Total recoveries	Recovered home rookery	
Years		Number	Percent	Years		Number	Percent
2	213	111	52	2	31	21	68
3	1,852	995	54	3	208	153	74
4	738	438	59	4	184	149	81
5	79	61	77	5	122	102	84
6	20	13	65	6	91	75	82
7	4	-	-	7	27	23	85
				8	6	4	67
				9	11	8	73
				10	5	4	80
				10+	14	5	36

Table 10.--Homing tendency of male and female seals, by rookery, Pribilof Islands, Alaska, 1964

Rookery of tagging	Males			Females		
	Total recoveries	Recovered home rookery		Total recoveries	Recovered home rookery	
		Number	Percent		Number	Percent
		St. Paul Island				
NEP	612	472	77	127	118	93
TOL	261	111	42	24	5	21
L-K	174	86	49	18	7	39
ZAP-1	454	267	59	194	169	87
REEF	528	277	52	117	87	74
POL	256	96	38	68	43	63
			Mean			Mean
Total	2,285	1,309	57	548	429	78
		St. George Island				
ZAP-2	143	66	46	47	42	89
NOR	270	166	61	59	45	76
EAST	118	58	49	13	5	38
STAR	90	19	21	32	23	72
			Mean			Mean
Total	621	309	50	151	115	76

A total of 302 seals selected and tagged as yearlings on St. Paul Island in 1961 (M-series), 1962 (N-series), and 1963 (O-series) were recovered on the Pribilof Islands in 1964. The recovery information is given in tables 11 and 12.

Information on 45 Soviet-tagged seals killed on the Pribilof Islands in 1964 is given in table 13 and in appendix table 15.

Tagging--Pups.--The number of pups tagged in 1963 is listed in table 14 by rookery, and a record of pups tagged on the Pribilof Islands since 1941 is given in appendix table 16. Tag and checkmark locations on pups tagged since 1947 are shown in appendix figure 1.

Of 24,991 Q-series tags attached to pups in 1964, 19,998 were used on St. Paul Island and 4,993 on St. George Island. This was the second year of a 2-year program designed to determine the influence, if any, of age of pups when tagged on survival. As in 1963, half of the pups on St. Paul Island were tagged in late August and half in late September. Mortality rates of the two groups will be compared in 1967 when the survivors return at age 3.

All tags used in 1963 and in August 1964 were attached at the hairline of the front flipper. Tags used in late September 1964 were attached about 2 inches toward the tip of the flipper from the hairline. At this point, tags will not interfere with muscles and blood vessels as they do when attached at the hairline.

Under the reduced tagging program, a crew of 10-12 men is adequate in that this number is large enough to complete tagging on the largest rookeries in 1 day, yet small enough to permit quality in tagging and gentler handling of pups.

Survey--Yearlings.--Surveys of certain areas on St. Paul Island were begun in 1963

Table 11.--Tag recoveries in 1964 from seals selected and tagged as yearlings, Pribilof Islands, Alaska

Series	Age	St. Paul Island		St. George Island		Total	
		Males	Females	Males	Females	Males	Females
		Number	Number	Number	Number	Number	Number
		Male kill (1 July to 7 August)					
N	3	194	-	21	-	215	-
	4	7	1	-	-	7	1
Total		201	1	21	-	222	1
O	2	34	-	6	-	40	-
	3	3	-	-	-	3	-
Total		37	-	6	-	43	-
		Female kill (14-28 August)					
M	4	-	1	-	-	-	1
	5	-	1	-	-	-	1
Total		-	2	-	-	-	2
N	3	-	6	3	2	3	8
	4	-	2	-	1	-	3
Total		-	8	3	3	3	11
O	2	11	-	5	-	16	-
	3	-	4	-	-	-	4
Total		11	4	5	-	16	4

Table 12.--Homing tendency of seals selected and tagged as yearlings, by sex and rookery, St. Paul Island, 1964

Rookery of tagging	Males			Females		
	Total recoveries	Recovered home rookery		Total recoveries	Recovered home rookery	
		Number	Percent		Number	Percent
Zapadni	67	25	37	5	4	80
Little Zapadni, Zapadni Reef	18	3	17	2	1	50
Reef	48	27	55	4	2	50
Tolstoi	18	12	67	-	-	-
Lukanin-Kitovi	7	3	43	-	-	-
Northeast Point	99	53	54	5	4	80
Polovina	5	1	20	2	1	50
Total and Percent	262	124	47	18	12	67

Table 13.--Summary of Soviet tags recovered from the kill, Pribilof Islands, Alaska, 1964

St. Paul Island				St. George Island[1]			
Male		Female		Male		Female	
Age	Number	Age	Number	Age	Number	Age	Number
2	5	2	1	2	2	-	-
3	7	3	1	3	4	-	-
4	14	4	1	4	5	4	1
5	3						
6	1						
Total	30		3		11		1

[1] One 3-year-old of undetermined sex not included.

Table 14.--Fur seal pup tagging, Pribilof Islands, Alaska, 1964

Date	Rookery	Proportion allotment	Number and series allotment	Tags spoiled	Pups
St. Paul Island		First tagging			
		Percent		Number	Number
14 Aug.	Reef	23.8	2,400 Q 9001-11400	-	2,400
12 Aug.	Polovina	10.7	1,050 Q13801-14850	-	1,050
12 Aug.	Little Polovina	3.0	300 Q15901-16200	-	300
13 Aug.	Northeast Point	24.6	2,450 Q16501-18950	-	2,450
15 Aug.	Tolstoi	10.1	1,000 Q21401-22400	-	1,000
12 Aug.	Lukanin-Kitovi	7.9	800 Q23401-24200	-	800
15-16 Aug.	Zapadni	11.4	1,150 Q 5001-6150	-	1,150
16 Aug.	Zapadni Reef	8.5	850 Q 7301-8150	-	850
		Total		-	10,000
			Second tagging		
18 Sept.	Reef	23.8	2,400 Q11401-13800	-	2,400
18 and 22 Sept.	Polovina	10.7	1,050 Q14851-15900	-	1,050
17 Sept.	Little Polovina	3.0	300 Q16201-16500	-	300
17 Sept.	Northeast Point	24.6	2,450 Q18951-21400	-	2,450
22 Sept.	Tolstoi	10.1	1,000 Q22401-23400	-	1,000
17 and 22-23 Sept.	Lukanin-Kitovi	7.9	800 Q24201-25000	2	798
16 Sept.	Zapadni	11.4	1,150 Q 6151-7300	-	1,150
16 Sept.	Zapadni Reef	8.5	850 Q 8151-9000	-	850
		Total		2	9,998
St. George Island					
25 Aug.	Zapadni	28.0	1,400 Q 3601-5000	2	1,398
20 Aug.	North	38.0	1,900 Q 1701-3600	2	1,898
25-26 Aug.	Staraya	16.0	800 Q 901-1700	3	797
27 Aug.	East	18.0	900 Q 1-900	-	900
		Total		7	4,993
		Grand total		9	24,991

and continued in 1964 to determine the relative number of known-age yearling seals on land in late September and early October. If the number of yearlings counted on land during the sampling period is related to the return of the age class 2 years later, yearling surveys will be useful as a method for predicting the kill of 3-year-old males. An additional 3 or 4 years of data are necessary, however, before it can be determined if such a relationship exists.

The results of the yearling surveys in 1964 are given in table 15. Methods and survey areas used have been described previously (Roppel, Johnson, and Chapman, 1963). Among known-age yearlings captured during the surveys in 1963 and 1964 and during yearling tagging in 1961, 1962, and 1963, males have outnumbered females by as much as 15 to 1.

Table 15.--Known-age[1] yearlings counted, by rookery, date, and sex, St. Paul Island, 1964

Rookery	24-25 September		1-2 October		8 October	
	♂	♀	♂	♀	♂	♀
NEP	6	-	7	1	1	-
POL	-	-	-	-	-	-
GOR	-	-	-	-	-	-
REEF	4	1	3	-	1	-
KIT	-	-	-	-	-	-
TOL	1	-	3	-	-	-
ZR	6	-	2	-	2	-
L. ZAP	3	-	-	1	-	-
ZAP	3	-	2	-	-	-
Total	23	1	17	2	4	-

[1] Seals tagged as pups in 1963.

Mortality

Pup mortality in 1964 decreased by 34 percent of the 1963 count on St. Paul Island and by 52 percent on St. George Island. The 1964 count of dead pups was the lowest since the beginning of complete counts in 1953. The data for both islands are given in table 16 by rookery, and dead-pup counts made since 1941 are presented in appendix table 17.

Table 16.--Dead-pup counts, Pribilof Islands, Alaska, 1964

Rookery	Dead pups
St. Paul Island	
Northeast Point	
Morjovi	1,830
Vostochini	3,404
Polovina	
Little Polovina	631
Polovina Cliffs	1,097
Polovina	783
Reef	
Ardiguen	102
Gorbatch	1,549
Reef	3,000
Kitovi	462
Lukanin	402
Tolstoi	2,614
Zapadni	
Little Zapadni	1,101
Zapadni Reef	425
Zapadni	4,172
Counted total	21,572
5 percent addition	1,079
Estimated total	22,651
St. George Island	
North	792
Zapadni	446
East	272
Staraya Artil	767
Counted total	2,277
5 percent addition	114
Estimated total	2,391
Summary - 1964	
Pribilof Islands counted total	23,849
5 percent addition	1,193
Estimated total	25,042

Population Estimates

Estimates of the pup population are currently derived from three sources: (1) The tag recoveries and tag loss identifications in the kill; (2) the ratio of marked to unmarked in samples of live pups; and (3) total counts of live pups on three rookeries and a portion of a fourth. In previous years the tag-lost to tagged ratio on St. George Island was changed to correspond to the ratio observed on St. Paul Island if there was an appreciable difference in the ratios observed on the two islands. This procedure was not used this year.

In 1964, for the first time, recoveries of tags from males tagged as yearlings were sufficiently numerous to form a basis for

estimating the number of seals from a year class alive at age 1.

Estimates of the Pup Population From the Recovery of Tagged Males.--During the period 17-19 July, the tag-lost recoveries on St. Paul Island were recorded incorrectly; therefore, the number of tag-lost for this period was estimated by the tag-lost to tagged ratio observed during the remainder of the male kill. Also, the tag-lost to tagged ratio for 2-year-old males was much higher on St. Paul Island than on St. George Island, 0.65 and 0.30, respectively (table 8).

Recent estimates of the pup population are lower than those of the mid- and late-1950's (tables 17, 18, and 19).

Estimates of the Pup Population From the Recovery of Tagged Females.--Two features should be noted in the tag recoveries from females (table 8). First, the tag-lost to tagged ratio is unrealistically high for 2-year-old females on St. Paul Island--this is probably the result of recording tag loss from 6-year-olds as that from 2-year-olds. Secondly, the tag-lost to tagged ratio for all ages is higher on St. Paul Island than on St. George Island.

Estimates of the 1960 and 1961 year classes based on the recovery of tagged females and of tagged males were similar (tables 17 and 20). The high but unreal rate of tag loss recorded on St. Paul Island for 2-year-olds resulted in the low estimate for that year class and a high estimate for the 1958 year class. Estimates based on the recoveries from tagged females have generally been more erratic than those based on recoveries from tagged males.

Estimated Number of Yearling Males, 1961 Year Class.--Length was first used as a basis for selecting yearling animals for tagging in 1962 (Roppel, Johnson, Bauer, Chapman, and Wilke, 1963). Of those tagged, most were yearlings, some were 2 years old and, for females at least, some were 3 years old. The ages of animals tagged as yearlings are determined from tooth ridge counts when the seals are taken in the kill; thus, the proportion older than 1 at the time of tagging can be estimated. For example, 2 of 46 males tagged as yearlings in 1962 and recovered from the kill in 1963 were older than 1 at the time of tagging. In 1964, 222 males tagged as yearlings were recovered from the kill; the ages of 7 had been incorrectly determined at the time of tagging. Thus, 3.4 percent of the males recovered were older than 1 at the time of tagging. On this basis, 600 or 96.6 percent of the 621 males selected and tagged as yearlings in 1962 on the basis of body length were actually yearlings. The estimate of the error (3.4 percent) in determining ages, however, is probably too high as seals older than 1 at the time of tagging have subsequently been available in the kill as 3- and 4-year-olds, while those that were age 1 have to date been available only as 2- and 3-year-olds. The probability of tagged seals being taken in the kill is greater at ages 3 and 4 than at ages 2 and 3. The error of 3.4 percent, if too high, would inflate the estimates of the number of yearlings.

Table 17.--Estimates of the pup population based on tag recoveries from males, Pribilof Islands, Alaska, year classes 1959-62

Year class	Killed 1 July to 7 August 1964 (n)	Tagged (t)	Tagged and tag-lost seals recovered (s)	Population estimate (N)
	Number	Number	Number	Number
1959	2,252	49,881	201	556,357
1960	13,073	59,981	1,275	614,580
1961	28,827	49,921	2,908	494,724
1962	2,726	49,908	364	372,882

n = number of males killed from each year class, 1 July through 7 August 1964.

t = number of tags applied to each year class.

s = number of tagged and tag-lost males recovered from each year class, 1 July through 7 August 1964.

N = estimated number of pups in each year class at time of tagging; $\frac{(n+1)(t+1)}{(s+1)}$.

Table 18.--Estimates of the pup population based on recoveries of tagged male seals at ages 3 and 4, Pribilof Islands, Alaska, year classes 1958-61

Year class	Killed at ages 3 and 4 (n)	Tagged (t)	Tagged and tag-lost seals recovered (s)	Population estimate (N)
	Number	Number	Number	Number
1958	74,890	49,917	5,409	691,018
1959	48,596	49,881	3,324	729,057
1960	31,059	59,981	3,279	568,000
1961	[1] 28,827	49,921	[1] 2,908	494,724

[1] Age 3 only.

n = number of 3- and 4-year-old males killed from each year class. Males accidentally taken during the female kill are excluded.
t = number of tags applied to each year class.
s = number of 3- and 4-year-old tagged and tag-lost males recovered from each year class during the male kill.
N = estimated number of pups in each year class at time of tagging; $\frac{(n+1)(t+1)}{(s+1)}$

Table 19.--Estimated number of pups born, Pribilof Islands, Alaska, year classes 1951-62[1]

Year class	Estimated number of pups alive at time of tagging	Dead-pup count	Estimated number of pups born
1951	484,000	86,000	570,000
1952	529,000	87,000	616,000
1953	704,000	91,000	795,000
1954	727,000	111,000	838,000
1955	778,000	90,000	868,000
1956	872,000	120,000	992,000
1957	637,000	75,000	712,000
1958	691,000	38,000	729,000
1959	729,000	49,000	778,000
1960	[2] 568,000	75,000	643,000
1961	[2] 495,000	71,000	566,000
1962	[3] 373,000	54,000	427,000

[1] See footnote 2, p. 29, for source of estimates 1951-59.
[2] From table 18, this report.
[3] From table 17, p. 16, this report.

Table 20.--Estimates of the pup populations based on tag recoveries from females, Pribilof Islands, Alaska, year classes 1958-62

Year class	Killed 14-29 August (n)	Tagged (t)	Tagged and tag-lost seals recovered (s)	Population estimate (N)
	Number	Number	Number	Number
1958	1,822	49,917	94	957,900
1959	3,543	49,881	228	775,359
1960	3,325	59,981	329	604,546
1961	3,354	49,921	353	473,131
1962	346	49,908	108	158,881

n = number of females killed from each year class, 14-29 August 1964.

t = number of tags applied to each year class.

s = number of tagged and tag-lost seals recovered from each year class, 14-29 August 1964.

N = estimated number of pups at time of tagging; $\frac{(n+1)(t+1)}{(s+1)}$.

Using the above information in the modified Petersen formula, the number of yearling males born in 1961 and still living at the time of tagging in 1962 can be estimated:

$$N = \frac{(600+1)(28827+1)}{(215+1)} = 80,211$$

where

600 is the number of tags applied to yearling males

28827 is the number of 3-year-old males taken from 1 July through 7 August 1964

and

215 is the number of recovered 3-year-old males tagged as yearlings 1 July through 7 August 1964

The estimate seems reasonable, but as previously mentioned, it may be slightly high.

Estimated Pup Population From Sampling Live Pups.--The methods used in marking and in sampling live pups on St. Paul Island in 1964 were the same as those used in 1963 (Roppel, Johnson, and Chapman, 1965), with the following exception. Shearing effort was distributed within each rookery according to the counted distribution of the harem bulls on the rookery. This method gave a more uniform distribution of sheared pups than was obtained in 1963. The number of pups sheared was 27,716.

All the live pups on three rookeries and a separated section of a fourth were counted, and the counts were compared to the estimates obtained on each of the rookeries from sampling (table 21). The estimates for the smaller rookeries were higher than the counts, but the estimate from the larger rookery was slightly less. The total area counted contained 11.0 percent of the total number of harem bulls on both islands. Though desirable, it would be extremely difficult, if not impossible, to count live pups on additional areas.

The estimated pup population for each rookery on St. Paul Island is given in table 22 for two sampling periods. The estimates from pup sampling have been of about the same magnitude since 1961 (table 23). To extend the estimate to include the pup population of both islands, the estimate for St. Paul Island was divided by the usual factor of 0.8, giving an overall estimate of 328,000. This estimate does not include the pups that died prior to shearing, something less than 25,000.

Estimated Pup Population From the Count of Pups on Four Rookeries.--The count of live pups on three rookeries and a portion of a fourth can be used to estimate the total pup population. Assuming that the ratio of pups per harem bull is the same for counted and

Table 21.--A comparison of total pup counts on four rookeries with pup population estimates from marked to unmarked ratios, St. Paul Island, year class 1964

Rookery	Count	Estimated pup population			Percent error in mean of estimates
		8-9 Aug.	15-16 Aug.	Mean	
Kitovi Amphitheatre	1,095	1,522	1,243	1,382	+26
Little Polovina	7,180	8,640	8,130	8,385	+17
Morjovi[1]	17,530	17,300	16,460	16,880	-4
Zapadni Reef	[2]5,700	6,130	6,900	6,515	+14

[1] Rocky Point south of Sea Lion Neck not included.
[2] Count corrected by adding 400 pups estimated to have swum out of the rookery area.

uncounted areas, the total pup population can be estimated from the counted pups and the harem bull count, that is,

$$\frac{31,505}{1,222} : \frac{N}{11,074} ; N = 285,000$$

where

31,505 is the number of pups counted
1,222 is the harem bull count on areas where pups were counted
11,074 is the total count of harem bulls for both islands

and

N is the pup population

The areas where pups were counted contained 11.0 percent of the total number of harem bulls on both islands.

Discussion of the Estimates of the Pup Population.--Recent estimates of the pup population from tag recoveries are lower than those of the mid- and late-1950's. Since 1960, the pup population has also been estimated from marked to unmarked ratios obtained from sampling live pups. The estimate obtained in 1960 was based on samples from only two rookeries; since 1961, all rookeries have been sampled. Where the results of the two methods (tag recoveries and sampling) can be compared, the estimates from sampling are lower than those from tag recoveries (table 24).

Attempts to check the accuracy of the estimates from sampling by counting live pups have been partially effective in that total pup counts were successfully made on one rookery in 1963 and on three rookeries in 1964. From the counts and sampling estimates it is impossible to derive a correction factor that can be used to improve the estimates. A correction factor may not, however, be needed. The counts show that it is highly improbable that the estimated pup population from sampling could be drastically in error. Hence, the best estimate of the 1964 pup population is about 350,000, that is, 328,000 plus pup mortality on land.

Table 22. --Estimates of the pup population from marked to unmarked ratios obtained after shearing, St. Paul Island, year class 1964

Rookery	Seals sheared	First sampling period, 8-9 August			Second sampling period, 15-16 August			Mean of two samples
		Samples	Sheared to total sampled	Estimated pup population at time of shearing	Samples	Sheared to total sampled	Estimated pup population at time of shearing	
	Number	Number	Ratio	Number	Number	Ratio	Number	Number
Gorbatch	2, 331	73	167/1825	25, 470	77	206/1925	21, 780	23, 625
Reef	3, 917	120	302/3000	38, 910	108	275/2700	38, 460	38, 685
Ardiguen	301	10	21/250	3, 580	9	33/225	2, 050	2, 815
Polovina	733	17	65/425	4, 790	18	60/450	5, 500	5, 145
Polovina Cliffs	2, 186	48	123/1200	21, 330	59	139/1475	23, 200	22, 265
Little Polovina	826	18	43/450	8, 640	13	33/325	8, 130	8, 385
Vostochni	4, 736	130	366/3250	42, 050	146	412/3650	41, 960	42, 005
Morjovi	2, 202	64	195/1600	18, 070	63	199/1575	17, 430	17, 750
Tolstoi	2, 771	90	257/2250	24, 260	95	247/2375	26, 640	25, 450
Lukanin	665	23	83/575	4, 610	24	71/600	5, 620	5, 115
Kitovi	1, 504	40	110/1000	13, 670	58	150/1450	14, 540	14, 105
Zapadni	3, 198	119	288/2975	33, 030	102	242/2550	33, 700	33, 365
Little Zapadni	1, 702	72	170/1800	18, 020	66	173/1650	16, 230	17, 125
Zapadni Reef	644	16	42/400	6, 130	15	35/375	6, 900	6, 515
Total	27, 716	840		262, 560	853		262, 140	262, 350

Table 23.--Estimates of the pup population from marked to unmarked ratios, St. Paul Island, year classes 1961-64

Rookery[1]	Year classes			
	1961[2]	1962[2]	1963[3]	1964[3]
Reef, Gorbatch, Ardiguen	85,700	52,800	55,600	65,100
Polovina, Polovina Cliff	21,600	22,900	23,800	27,400
Little Polovina	7,500	7,200	6,500	8,400
Vostochni, Morjovi	47,400	36,700	52,000	59,800
Tolstoi	34,800	19,300	23,600	25,400
Little Zapadni	18,900	19,200	20,000	17,100
Zapadni, Zapadni Reef	38,000	33,600	32,400	39,900
Lukanin, Kotovi	22,100	11,900	16,000	19,200
Total	276,000	203,600	229,900	262,300

[1] The estimates for some rookeries have been combined so that the estimates for each year are comparable.
[2] Pups marked by tagging.
[3] Pups marked by shearing.

Table 24.--Estimates of the pup population from live pup sampling and tag recoveries, Pribilof Islands, Alaska, year classes 1960-64

Year class	Estimate from live pup sampling	Estimate from tag recoveries
1960	[1] 438,000	[2] 568,000
1961	[3] 345,000	[2] 495,000
1962	[3] 255,000	[4] 373,000
1963	[3] 287,000	-
1964	[3] 328,000	-

[1] Estimated from sampling pups on two rookeries and extending to both islands.
[2] From table 18, p. 17, this report.
[3] From table 23, p. 21, this report, and divided by 0.8 to represent both islands.
[4] From table 17, p. 16, this report.

Seal-pup Weights

Since 1957, seal pups have been weighed annually on St. Paul Island about 1 September. The primary purpose was to determine if the mean weight of pups is related to the return of the year class 3 and 4 years later. There are as yet not enough data to determine if the relation between weight as pups and return of the year class will be of value for predicting returns (table 25). Preliminary studies are not encouraging.

As in previous years (Roppel, Johnson, and Chapman, 1965) the weighing program produced important secondary information on differences in the mean weights of tagged and untagged pups (tables 26 and 27). In 1964, tagged males and females averaged 1.10 and 0.92 kg. less than untagged males and females. This weight difference is 12 percent of the mean weights of untagged males and females.

Appendix table 18 lists the tag numbers and weights of tagged pups by rookery and by sex.

Table 25.--Mean weights[1/] of untagged pups and male returns, Pribilof Islands, Alaska, year classes 1957-60

Year class	Mean weight		Return in thousands
	Males	Females	
	Kg.	Kg.	
1957	8.7 (391)	7.7 (351)	53
1958	11.4 (127)	9.9 (121)	80
1959	9.4 (444)	8.1 (386)	55
1960	9.8 (372)	9.1 (363)	34

[1/] Numbers in parentheses are the number of pups in each sample.

Table 26.--Mean weights of seal pups,[1/] St. Paul Island, year class 1964

Rookery	Males		Females	
	Untagged	Tagged	Untagged	Tagged
	Kg.	Kg.	Kg.	Kg.
NEP	9.68 (75)	8.49 (75)	7.76 (75)	7.20 (75)
REEF	8.69 (75)	7.39 (73)	7.36 (75)	6.54 (73)
ZAP	7.80 (75)	7.59 (75)	6.93 (75)	6.29 (74)
POL	10.26 (75)	8.54 (74)	8.86 (75)	7.23 (72)

[1/] Numbers in parentheses are the number of pups in each sample.

Table 27.--Mean weights[1/] of seal pups approximately 1 week after tagging, St. Paul Island, year classes 1957-64

Group	1957	1958	1959	1960	1961	1962[2/]	1963[3/]	1964[3/]
	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.	Kg.
Males								
Tagged	7.9	-	9.0	9.2	8.0	8.4	8.3	8.0
	(262)		(182)	(211)	(186)	(300)	(299)	(297)
Untagged	8.7	11.4	9.4	9.8	8.5	9.2	8.9	9.1
	(391)	(127)	(444)	(372)	(381)	(300)	(300)	(300)
Females								
Tagged	7.4	-	8.0	8.4	7.2	7.6	7.3	6.8
	(196)		(188)	(254)	(167)	(300)	(296)	(294)
Untagged	7.7	9.9	8.1	9.1	8.0	8.2	8.0	7.7
	(351)	(121)	(386)	(363)	(466)	(300)	(300)	(300)

[1/] Numbers in parentheses are the number of pups in each sample.

[2/] Mean weights from the first of three weighings.

[3/] Two weeks after tagging.

RELATED STUDIES

Since 1958, 1,884 skins were collected on St. Paul Island for experimental use in relating economic value to biological factors, particularly age and sex. Table 28 lists the skins taken and marked to permit identification through processing into finished furs.

Table 28.--Skins collected for experimental use, St. Paul Island, 1958 and 1961-64

	Males		Females	
Year	Number	Ages	Number	Ages
1958	-	-	248	2-10
1961	-	-	117	2-5
1962	9	2-4	171	2-15
1963	142	3-6	120	3-6
1964	641	2-7	436	2-6

Experimental skins taken in 1958 and 1961-62 were processed, graded, and sold. Those collected in 1963 and 1964 are currently in cold storage where they will be held until processed.

Sectioned teeth of eight 8-year-old female fur seals were examined by the Laboratory of Radiation Biology, University of Washington. A substance (strontium 90?) which affected photographic film was found in the 1962-63 layer of dentin in certain teeth. Studies are continuing.

A survey was completed of the surface features of sheared sealskin. Plastic impressions were made from the sheared skins of various seals representing the 20 genera of Pinnipedia. One purpose of the study was to provide a key to the identification of fragments found in the stomachs of killer whales, sharks, and other predators.[1][2]

SUMMARY

Males:

1. Of 48,980 male seals killed on the Pribilof Islands in 1964, 47,011 were taken during the male kill from 1 July to 7 August and 1,969 were taken during the female kill 14-28 August. St. Paul Island supplied 37,789, and St. George Island, 11,191. Based on a collection of 6,727 right upper canine teeth, age classification of the kill in percent for ages 2-5 was: St. Paul Island, 7, 60, 28, and 5; St. George Island, 10, 62, 23, and 5. In 1964, male seals were taken from the minimum limits of 42 inches, tip of nose to tip of tail, up to but not including those having a mane.

[1]Victor B. Scheffer. 1964. Hair patterns in seals (Pinnipedia). Journal of Morphology (in press).

[2]Victor B. Scheffer. 1964. Estimating abundance of pelage fibres on fur seal skin. Proceedings of the Zoological Society of London (in press).

2. The peak of the kill occurred during round 7 (27-31 July) when 6,550 males were taken on St. Paul Island. The predicted male kill on St. Paul Island by 5 August 1964 included 24,000 of age 3 and 13,000 of age 4. Actual kills were 22,203 and 10,509 of ages 3 and 4, respectively. The predicted male kill as of 5 August 1964 includes 4,000 of ages 2 and 5, 33,000 of age 3, and 16,000 of age 4.

3. Harem bulls counted 10-17 July 1964 decreased by 2 percent of the 1963 count, and idle bulls were 10 percent less. Counts in 1964 were 11,074 harem and 8,584 idle.

4. Tags and checkmarks recovered from 4-year-old male seals in 1964 yielded an estimate of 614,580 pups of the 1960 year class alive at the time of tagging. Based on tags and checkmarks from 3-year-old male seals, there were 494,724 pups alive at the time of tagging in 1961.

5. Based on tag recoveries at age 3 in 1964 from male seals tagged as yearlings in 1962, an estimated 80,211 male seals of the 1961 year class survived to age 1.

6. Exclusive of pups that died before shearing, marked to unmarked ratios obtained from shearing the heads of 27,716 pups and subsequent sampling yielded an estimate of 353,000 pups born on the Pribilof Islands in 1964. Total counts of live pups on three rookeries and a portion of a fourth supported the estimates.

Females:

1. Of 16,452 female seals killed on the Pribilof Islands in 1964, 14,602 were taken during the female kill 14-28 August and 1,850 were taken during the male kill from 1 July to 7 August. Seventy-two percent were in ages 2-5, and 28 percent were age 6 and older. Age classification of the kill was based on a collection of 3,034 right upper canine teeth. Females having black or a mixture of black and white vibrissae were selected for killing; most females having white vibrissae were allowed to escape.

2. There was little difference in the age composition of females taken from traditional male hauling grounds, from rookery fringes, or from mixed areas.

3. Of 147 3-year-old females examined, none had given birth to pups in 1964 or previously. Three of 73 4-year-old females were primiparous and post partum.

4. Pup populations estimated from tags and checkmarks recovered from females were 604,546 for the 1960 year class at the time of tagging and 473,131 for 1961.

Tag Recoveries and Tagging:

1. The kill in 1964 included 4,205 seals tagged as pups and 1,890 with checkmarks only. In addition, 45 Soviet-tagged seals were taken, and 302 seals selected and tagged as yearlings in previous years were recovered.

2. A total of 24,991 pups were tagged on the right fore flipper with Q-series tags. The tip of the same flipper was sliced off as a checkmark.

3. Three counts of yearlings tagged as pups in 1963 were made from 24 September to 8 October on nine sample areas on St. Paul Island. The counts may make possible an index to survival from birth to age 1 and assist in predicting the return of 3-year-old male seals 2 years later.

Mortality: Pup mortality on land decreased to 25,042 in 1964 from 39,239 in 1963. The 1964 level was the lowest recorded since the beginning of complete dead-pup counts in 1953.

Seal-pup Weights: Weights of 1,191 pups showed that tagged males and females weighed 1.10 and 0.92 kg. less than untagged males and females.

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GLOSSARY

The following terms used in fur seal research and management on the Pribilof Islands have special meanings or are not readily found in standard dictionaries.

Age Class Age group. Seals of the same age (usually used when referring to seals older than pups). See year class.

At Time of Tagging (or Sampling) Phrases used to qualify estimates of the population based on (1) tag returns at various ages or (2) sampling for a marked to unmarked ratio in the summer of birth. In either case, an estimate of the total number of pups born in a given year would include pups alive "at time of tagging" ("or sampling") plus the number that died before tagging or sampling.

Checkmark A notch, slit, hole, or other mark made on a seal flipper when a tag is applied, to insure later recognition of an animal which has lost its tag.

Clinch or Clinching The device or action by which metal tags applied to seal flippers are fastened. A metal point is inserted through an opening in the opposite end of the metal strip then bent over a narrow band to form a closed ring (or tag).

Drive The act of surrounding and moving groups of seals on land from one location to another.

Escapement Seals that were not killed because they were either too old, too large, or were not available.

Female Kill That part of the annual harvest devoted principally to the kill of female seals, usually in August. See male kill.

General Breeding Season Organized breeding beginning about mid-June and ending in early August. Identifiable by the formation of harems. A limited amount of breeding also occurs after the break-up of the harem structure.

Hauling Grounds An area, usually near a rookery, on which nonbreeding animals congregate.

Haul Out The act of seals moving from the sea to a rookery or hauling grounds on shore.

Homing Tendency The inclination of seals to return to the rookery where they were born, that is, home rookery or rookery of birth. Homing tendency is expressed as a percentage by comparing the number of tagged seals in a specific group that were found on their natal rookery with the number that were found on some other rookery or island.

Known-Age Applied to seals for which age is definitely known because they bear an inscribed tag or have a certain combination of tag scar and checkmark.

Male Kill That part of the annual harvest devoted principally to the kill of male seals, usually in late June, in July, and in early August. See female kill.

Marked Seals that have been tagged, sheared, or otherwise artificially marked so that they can be identified.

Marked to Unmarked Ratio The number of marked seals compared to the number of unmarked seals, usually expressed as a decimal fraction. Example, 5:20, ratio .25.

Mixed Areas Areas behind some of the rookeries on which few seals appear until August, or after the general breeding season. Seals using these areas at that time may be a mixture of animals from traditional hauling grounds and from the rookery.

Mortality Rate Percent of a year class dying during a specific period.

Pregnancy Rate Percent females that were carrying or had borne pups in the year examined. For example, the pregnancy rate of 5-year-old females was 69 percent.

Return The return or survival of seals from a year class. For example, 10,000 3-year-old seals from the 1960 year class returned in 1963.

Round The sequence in which hauling grounds on St. Paul Island are visited in order to collect seals for harvest. Current practice is to make a complete circuit or round of the hauling grounds in 5 days, repeating the procedure throughout the male kill. The round system is not followed during the female kill on St. Paul Island, nor during the male and female kills on St. George Island.

Round-Up The act of surrounding and collecting seals to be driven for harvest, tagging, or other purposes.

Tagged Describes a seal having an inscribed metal tag or tags attached to one or more of its flippers.

Tag-Lost A term applied to a seal that is known to have been tagged because of a checkmark and, in some cases, a healed tag scar. See tag scar.

Tag Scar A hole or torn area near the usual tag site on a seal's flipper. Tags fall out because of poor clinching or wear and are forcibly torn out by catching in rock crevices or driftwood. Possibly some are torn out by the tagged seal.

Tagged to Untagged Ratio See marked to unmarked ratio.

Tag Lost to Tag Ratio The number of seals that have lost tags as compared with the number retaining tags. Usually expressed as a decimal fraction.

Year Class Group of seals born in the same year. See age class.

Appendix A

PREDICTION OF 1965 MALE KILL

Douglas G. Chapman

16 November 1964

Quantitative methods of predicting the annual male fur seal harvest were first discussed in 1959.[1] This discussion was concerned both with preseason and inseason predictions. Subsequently, only preseason predictions were studied and actually made for the seasons 1961 to 1964. Several methods were used in this prediction analysis. The predictions for most years were only moderately successful, though the forecast for 1964 was the most accurate yet made. Nevertheless, the prediction errors still are quite large. Some attempt is made to assess these errors, but this is difficult because each prediction may be a composite of several partially independent predictions. Moreover, various "adjustments" have to be made in previous data for varying termination dates of the kill and length limits, and additional adjustments must be made in the predictions to extrapolate St. Paul Island estimates to both islands.

As is obvious, the forecast of the 4-year male kill is relatively easy, since the kill of the 3-year-olds from this year class provides a substantial amount of data on which to base the forecast. The prediction of the larger 3-year-old component is based on much more tenuous data; thus the errors of prediction for a kill of this age class are much larger.

Prediction of 4-year old male kill

Predictions of 4-year-old male kills in former years have been based on one or more of (a) the estimate of 3-year male escapement, (b) the population-return equation, (c) the dead-pup count-return equation, and (d) the temperature-return equation.

Chapman (1964) showed that the estimates of escapement based on estimating the return of 3-year males after termination of killing and the proportion of undersize or oversize animals were inconsistent with the estimates of recruitment to the population of adult males. Consequently, the escapement estimate was replaced by a direct regression of 4-year male kill on 3-year male kill and the mean date of the latter.

An analysis made in 1963 (appendix table 3; Roppel, Johnson, and Chapman, 1965) showed that the dead-pup count yielded essentially no additional predictive information over the temperature data, and thus this regression was also eliminated.

New data available in 1964 may be useful for forecasting purposes, that is, the recovery of seals selected and tagged as yearlings in 1962. This provides an estimate of the size of the 1961 year class in 1962 when it is hoped that the heaviest and most variable component of mortality has already taken place. If this is true, a small proportion can be subtracted from this estimated number of yearlings for mortality in the next 2 years, and the balance will then either be harvested or escape to join the breeding reserve.

Method 1.--Regression of 4-year-male kill on 3-year-male kill and the mean date of the kill of 3-year-olds. This regression is based on the data in appendix table 1.

Because there were two starting dates and several termination dates for the kills during the past several years, the adjustments indicated in the footnotes to appendix table 1 were made. The basis of these adjustments was reported previously (Roppel, Johnson, and Chapman, 1965).

Appendix table 1.--The 3- and 4-year-old male kill and mean date of the 3-year-old male kill, St. Paul Island, year classes 1952-60

Year class	3-year male kill to 31 July	4-year male kill adjusted[1]	Mean date of 3-year male kill[2]
	Number	Number	Days after 15 July
1952	31,000	29,000	5
1953	27,000	17,000	4
1954	17,000	11,000	3
1955	27,000	11,000	2
1956	10,000	3,000	3
1957	15,000	20,000	4
1958	30,000	27,000	4
1959	20,000	17,000	3
1960	12,000	12,000	4

[1] Kill of 4-year-old males to 31 July, plus 80 percent of the number of 3-year-old males taken after 31 July from the same year class.

[2] Adjusted to the base of a common starting round on 27 June.

[1] Douglas G. Chapman [p. 49]. In Carl E. Abegglen, Alton Y. Roppel, and Ford Wilke. Alaska fur seal investigations, Pribilof Islands, Alaska. Report of Field activities, June-September 1959. Bureau of Commercial Fisheries Marine Mammal Biological Laboratory, Seattle, Wash. [Processed.]

The regression determined from the data is:

$$Y = -15.10 + 0.60\,x_1 + 5.29\,x_2$$

where x_1 = kill of 3-year-old males to 31 July

x_2 = mean date of the 3-year-old male kill in days past 15 July

Y = kill of 4-year-old males to 31 July, plus 80 percent of the 3-year-old male kill after 31 July

This regression, which is based on 1 year of additional data, is very similar to that given in 1963 (Roppel, Johnson, and Chapman, 1965), and to two decimals, R^2 is 0.82 as it was in 1963.

For the 1961 year class, which will be 4 years old in 1965, $x_1 = 18$, $x_2 = 4$, so that $Y = 16.9$.

Deleting 3,900 (80 percent of the 3-year male kill of 1964 after 31 July) and adding 10 percent for the 4-year male kill expected in August 1965, yields an estimate of 14,300 for the 1965 4-year-old male kill.

Method 2.--Temperature-return regression. The basic data for this regression are given in appendix table 2.

The regression is:

$$Y = 16.0 + 0.99\,T$$

where Y = adjusted kill

T = mean temperature in tenths of a degree above 32°

Appendix table 2.--The 3- and 4-year-old male kill and mean temperature, St. Paul Island, year classes 1950-60

Year class	Adjusted kill[1]	Temperature[2]
	Number	Degrees Fahrenheit
1950	56,000	35
1951	50,000	36
1952	60,000	37
1953	44,000	16
1954	28,000	10
1955	38,000	17
1956	13,000	1
1957	35,000	23
1958	57,000	34
1959	37,000	33
1960	23,000	26

[1] Kill prior to 31 July, plus 80 percent of the number of 3-year-olds taken in August.

[2] Mean temperature for 12-month period ending 30 June of the indicated year, measured in tenths of a degree above 32°.

For 1961, the value of T is 18, so that Y = 33.8. The kill of 3-year-old males in 1964 prior to 31 July was 17,600, and 80 percent of the kill in August (4,861) is 3,900, so that there remains for 1965 (to 31 July), 12,300. An additional 10 percent expected in August 1965 brings the total kill of 4-year-old males to 13,500.

Method 3.--Estimates from the yearling population estimate. Of 621 male yearlings tagged or retagged in 1962, 259 were recovered in 1963 as 2-year-olds or in 1964 as 3-year-olds. Additionally, in 1963 and 1964, nine were recovered as 3- and 4-year-olds, respectively, indicating a small degree of error in the estimating of ages during tagging. These nine seals were the survivors of 2 years' natural mortality at a rate of approximately 10 percent per year. Also, the 3-year-old kill is approximately equal to the 4-year-old kill plus escapement, so that it may be estimated that these 9 suggest that a total of 20 of the original 621 were older than 1 at the time of tagging. The total 2-year-old kill on both islands in 1963 was 2,019, and the 3-year-old kill in 1964 totaled 29,416. Combined, these kills total 31,435. Hence, the estimate of the number (N) of yearlings from both islands alive in 1962 is:

$$N_{1962} = \frac{(31,436)(602)}{260} = 72,786 \text{ or } 72,800$$

Reducing 72,800 by 10 percent for the annual mortality from age 1 to age 2 (a very rough estimate) and the 2-year-old kill, and further reducing it by 10 percent for the next year's natural mortality and a kill of 29,400, leaves a balance of 27,800. A further overwintering mortality in 1964-65 of 10 percent and an escapement of about 10,000 imply a balance of 15,000 for the 4-year-old male kill in 1965. Eighty percent of this is 12,000, which would be the St. Paul Island estimate by this method. Despite the obvious inadequacies of the data used in this method, it agrees very closely with the previous two estimates.

Prediction of 3-year-old Male Kill

In the past several years, the prediction of the 3-year-old male kill has been based on one or more of (a) the population-return equation, (b) the dead-pup count-return equation, and (c) the temperature-return equation. In addition, attempts have been made to utilize the 2-year-old male kill data on the cumulative estimates of the female population for forecast purposes. These have been unsuccessful, though some additional discussion on the cumulative estimate and its relationship to the 3-year-old kill is given below. Also, a forecast based on the return from yearling tagging is obtained.

Method 1.--Temperature-return regression. This forecast equation, which was given on page 27, implies a return of 36,800 for the 1962 year class (for which T = 21). This return, or adjusted kill, is the kill of 3- and 4-year-old males to 31 July, plus 80 percent of the kill of 3-year-old males in August. Where the termination date has been 5 August, the total 3- and 4-year-old male kill has exceeded this adjusted kill by about 8 percent.

Hence, this suggests a kill from the 1962 year class at ages 3 and 4 of 39,700. In years with a 5 August termination date, the 3-year-old male kill is about 61 percent of the total 3- and 4-year-old male kill. This leads to an estimated St. Paul Island 3-year-old male kill in 1965 of 24,000.

Method 2.--Yearling estimate. In 1963, 551 yearling males were tagged or retagged. In 1964, 56 recoveries were made of these males that were of the correct age, that is, 2 years old. In addition, there were three of age 3, that is, animals that were age 2 at the time of tagging. The proportion older than 1 at the time of tagging is similar to the situation in the previous year, that is, from the 1962 yearling tagging 44 2-year-old males and 2 3-year-old males were recaptured in 1963. The subsequent data have shown that the proportion older than 1 in 1962 was 3.2 percent. Using this adjustment, the estimated size of the yearling class in 1963 was:

$$N_{1963} = \frac{3,679(534)}{57} = 34,500$$

Here 3,679 = 3,678 + 1, where 3,678 is the 1964 2-year-old male kill. This is obviously a low estimate. The estimate made on the basis of similar data in 1963 of the size of the yearling class in 1962 was similarly low. It was in fact:

$$N^1_{1962} = \frac{(2,020)(606)}{45} = 27,200$$

This suggests that the 1963 yearling group may have been 27 percent larger than the 1962 yearling group ($\frac{34.5}{27.2} = 1.27$).

With other mortality factors remaining about the same, this implies a St. Paul Island 1965 3-year-old male kill of (24,500)(1.27) or 28,600.

Other methods.--A complete kill of all available 2-year-old males in late July would seem to be a possible index of the later harvest to be expected from a year class. To obtain uniform data over a period of years, a regression of the 3-year-old male kill to 31 July was calculated on the kill of 2-year-old males in the last round (27-31) of July of the previous year, that is, from the same year class. The regression is $Y = 14.9 + 1.713X$, which is based on data from the 1952-61 year classes. Here Y is the 3-year-old male kill (in thousands) to 31 July, and X is the kill (in hundreds) of the 2-year-old males in the last round (27-31) of July of the previous year. For the 1962 year class, X = 4.3, hence Y is predicted to be 21.9. Adding 10 percent for the expected kill in August yields a season total of 24,100. This is in excellent agreement with estimates found by methods 1 and 2. The value of r^2 for this relationship, however, is only 0.20, that is, only 20 percent of the variation of Y is associated with or due to X. Thus the relationship can be expected to yield quite erratic predictions in general.

As mentioned earlier, an estimate of the predicted 3-year-old male kill for 1964 was based, in 1963, on the ratio of past kills to the cumulative female population estimate. Though this was unsatisfactory, it was thought that the cumulative female estimates might be used with the temperature data to give improved estimates. The cumulative estimates taken from a previous study (Chapman, 1964) are given in appendix table 3.

Appendix table 3.--Cumulative female population estimates, 1950-60

Year	Estimate	Year	Estimate
1950	850,000	1956	860,000
1951	850,000	1957	800,000
1952	830,000	1958	740,000
1953	840,000	1959	650,000
1954	850,000	1960	610,000
1955	870,000		

A regression of the adjusted kill, as shown in appendix table 2, was calculated using these estimates and temperature data (also given in appendix table 2). The resulting equation is:

$$Y = -56.0 + 1.20\,T + 0.84F$$

where Y = adjusted kill

T = temperature (in tenths of a degree above 32)

F = estimated number of females

The addition of the new variable is significant when tested by the usual analysis of variance methods (F = 12.08, which is highly significant) and for the multiple regression $R^2 = 0.85$, which is very high. When applied to the data for 1961, however, the estimated Y is 17,800, which is lower than the number of 3-year-old males already taken in 1964. Whether this is an aberrant observation or whether the relationship is already changing as the herd responds to the reduction program that has taken place must be left for future observations to decide.

Reliability of the Estimates

For the estimates obtained directly from a regression equation it is easy to compute confidence interval estimates to suggest their reliability. Final estimates, however, are obtained by additional adjustment which add additional variability. On the other hand, the agreement between estimates obtained in different ways yields additional confidence.

Some confidence intervals are:

For the estimate of the 4-year-old male kill to 31 July by method 1, Y lies between 16,900 ± 10,500, that is, between 6,400 and 27,400 with 95 percent confidence.

For the estimate of the adjusted kill of the 1961 year class by method 2, the 95 percent confidence interval for Y is 33,800 ± 23,000, that is, from 10,800 to 56,800.

The width of these confidence intervals should indicate the caution that must still be exercised in regard to forecasts of the male harvest.

Final Predictions by Ages and by Islands

The estimates given above are averaged to yield St. Paul Island figures. Further, the long-term relation between St. Paul and St. George Island in regard to the male kill is the basis of the extrapolation of the estimate to St. George Island. It should be pointed out, however, that in 1964 as in 1963 the fraction of the kill on St. George Island was higher than the long-term average. The average of the St. George Island kill to the total for both islands for the period 1950-64 is exactly 20 percent. The results are shown in appendix table 4.

Appendix table 4.--Prediction of the kill in 1965, by age, Pribilof Islands, Alaska

Island	Age			Total
	2 and 5	3	4	
St. Paul	3,000	26,000	13,000	42,000
St. George	1,000	7,000	3,000	11,000
Total	4,000	33,000	16,000	53,000

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1965. Fur seal investigations, Pribilof Islands, Alaska, 1963. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 497, 60 p.

Appendix B

Appendix table 5. --Age classification of male seals killed on St. Paul Island, 1 July to 5 August and 17-28 August 1964

Date	Rookery	Number		Percent in each age class of sample					Estimated number killed from each age class				
		Males killed[1]	Tooth sample	2	3	4	5	6	2	3	4	5	6
1 July	NEP	947	118	1	41	41	14	3	10	388	388	133	28
2	TZR	779	159	3	40	51	6	-	23	312	397	47	-
2	REEF-LK	1,012	127	-	32	58	10	-	-	324	587	101	-
5	ZAP	840	85	-	44	49	7	-	-	370	412	58	-
6	POL	651	84	1	53	40	6	-	7	345	260	39	-
6	LK	145	29	-	55	35	10	-	-	80	51	14	-
Round total		4,374	602						40	1,819	2,095	392	28
7 July	NEP	1,156	116	2	38	51	8	1	23	439	590	92	12
8	TZR	553	107	1	56	38	5	-	5	310	210	28	-
9	ZAP	457	45	-	40	51	9	-	-	183	233	41	-
10	REEF-LK	569	88	-	50	43	7	-	-	283	247	39	-
11	POL	339	42	-	68	32	-	-	-	232	107	-	-
Round total		3,074	398						28	1,447	1,387	200	12
12 July	NEP	1,429	143	2	60	34	4	-	28	857	485	59	-
13	TZR	385	75	3	65	24	5	3	11	250	92	20	12
14	ZAP	790	79	3	45	49	3	-	24	355	387	24	-
15	REEF-LK	1,251	139	3	56	36	5	-	40	703	448	60	-
16	POL	315	70	3	60	23	14	-	9	188	74	44	-
Round total		4,170	506						112	2,353	1,486	207	12
17 July	NEP	1,950	381	5	62	28	5	-	98	1,209	545	98	-
18	TZR	1,073	213	6	63	26	5	-	64	676	279	54	-
19	ZAP	1,767	351	3	63	31	3	-	53	1,113	548	53	-
20	REEF-LK	1,043	205	7	56	29	7	1	73	584	303	73	10
21	POL	223	44	2	59	30	9	-	4	132	67	20	-
Round total		6,056	1,194						292	3,714	1,742	298	10
22 July	NEP	1,601	321	9	65	24	2	-	144	1,041	384	32	-
23	TZR	638	126	7	54	33	6	-	45	345	210	38	-
24	ZAP	1,746	345	3	64	29	4	-	52	1,118	506	70	-
25	REEF-LK	1,420	143	4	64	25	6	1	57	909	355	85	14
26	POL	632	56	5	70	18	5	2	32	442	114	32	12
Round total		6,037	991						330	3,855	1,569	257	26
27 July	NEP	2,197	219	6	69	20	5	-	132	1,516	439	110	-
28	TZR	877	103	4	57	33	5	1	35	500	289	44	9
29	ZAP	1,165	119	5	66	24	5	-	58	769	280	58	-
30	REEF-LK	1,985	196	9	72	14	5	-	179	1,429	278	99	-
31	POL	326	69	9	63	18	3	7	29	205	59	10	23
Round total		6,550	706						433	4,419	1,345	321	32
1 Aug.	NEP	2,299	244	11	75	13	1	-	253	1,724	299	23	-
2	TZR	201	57	14	59	15	12	-	28	119	30	24	-
3	ZAP	2,117	217	12	70	16	2	-	254	1,482	339	42	-
4	REEF-LK	812	102	12	71	17	-	-	97	577	138	-	-
5	POL	281	37	35	49	16	-	-	98	138	45	-	-
5	NEP	678	86	13	82	5	-	-	88	556	34	-	-
Round total		6,388	743						818	4,596	885	89	-
August 17-28		[2] 1,140	273	63	34	3	-	-	486	265	24	-	2
Season total		[3] 37,789	5,413						2,539	22,468	10,533	1,764	122

[1] Includes experimental and rejected skins.
[2] Age classification of these males calculated on a daily basis, then combined.
[3] Includes 363 unclassified males.

Appendix table 6. --Cumulative age classification of male seals killed on St. Paul Island, 1 July to 5 August and 17-28 August 1964

Date	Rookery	Estimated number killed from each age class					Total kill	Percent killed from each age class				
		2	3	4	5	6		2	3	4	5	6
1 July	NEP	10	388	388	133	28	947	1	41	41	14	3
2	TZR	33	700	785	180	28	1,726	2	40	46	10	2
2	REEF-LK	33	1,024	1,372	281	28	2,738	1	38	50	10	1
5	ZAP	33	1,394	1,784	339	28	3,578	1	39	50	9	1
6	POL	40	1,739	2,044	378	28	4,229	1	41	48	9	1
6	LK	40	1,819	2,095	392	28	4,374	1	41	48	9	1
7	NEP	63	2,258	2,685	484	40	5,530	1	41	48	9	1
8	TZR	68	2,568	2,895	512	40	6,083	1	42	48	8	1
9	ZAP	68	2,751	3,128	553	40	6,540	1	42	48	8	1
10	REEF-LK	68	3,034	3,375	592	40	7,109	1	43	47	8	1
11	POL	68	3,266	3,482	592	40	7,448	1	44	47	8	-
12	NEP	96	4,123	3,967	651	40	8,877	1	47	45	7	-
13	TZR	107	4,373	4,059	671	52	9,262	1	47	44	7	1
14	ZAP	131	4,728	4,446	695	52	10,052	1	47	44	7	1
15	REEF-LK	171	5,431	4,894	755	52	11,303	2	48	43	7	-
16	POL	180	5,619	4,968	799	52	11,618	2	48	43	7	-
17	NEP	278	6,828	5,513	897	52	13,568	2	51	40	7	-
18	TZR	342	7,504	5,792	951	52	14,641	2	51	40	7	-
19	ZAP	395	8,617	6,340	1,004	52	16,408	2	53	39	2	-
20	REEF-LK	468	9,201	6,643	1,077	62	17,451	3	53	38	6	-
21	POL	472	9,333	6,710	1,097	62	17,674	3	53	38	6	-
22	NEP	616	10,374	7,094	1,129	62	19,275	3	54	37	6	-
23	TZR	661	10,719	7,304	1,167	62	19,913	3	54	37	6	-
24	ZAP	713	11,837	7,810	1,237	62	21,659	3	55	36	6	-
25	REEF-LK	770	12,746	8,165	1,322	76	23,079	3	55	36	6	-
26	POL	802	13,188	8,279	1,354	88	23,711	3	56	35	6	-
27	NEP	934	14,704	8,718	1,464	88	25,908	4	57	34	5	-
28	TZR	969	15,204	9,007	1,508	97	26,785	4	57	34	5	-
29	ZAP	1,027	15,973	9,287	1,566	97	27,950	4	57	33	6	-
30	REEF-LK	1,206	17,402	9,565	1,665	97	29,935	4	58	32	6	-
31	POL	1,235	17,607	9,624	1,675	120	30,261	4	58	32	6	-
1 Aug.	NEP	1,488	19,331	9,923	1,698	120	32,560	5	59	31	5	-
2	TZR	1,516	19,450	9,953	1,722	120	32,761	5	59	31	5	-
3	ZAP	1,770	20,932	10,292	1,764	120	34,878	5	60	30	5	-
4	REEF-LK	1,867	21,509	10,430	1,764	120	35,690	5	61	29	5	-
5	POL	1,965	21,647	10,475	1,764	120	35,971	6	60	29	5	-
5	NEP	2,053	22,203	10,509	1,764	120	36,649	6	60	29	5	-
17-28 Aug.		2,539	22,468	10,533	1,764	122	[1] 37,789	7	60	28	5	-

[1] Includes 363 unclassified males.

Appendix table 7. --Age classification of male seals killed on St. George Island, 1 July to 7 August and 14-26 August 1964

Date	Rookery	Number		Percent in each age class of sample					Estimated number killed from each age class				
		Males killed	Tooth sample	2	3	4	5	6	2	3	4	5	6
July													
1	NOR	389	73	-	53	40	7	-	-	206	156	27	-
6	NOR	104	28	-	64	29	7	-	-	67	30	7	-
6	ZAP	370	74	-	35	57	8	-	-	130	211	29	-
8	NOR	313	61	2	67	26	5	-	6	210	81	16	-
8	EAST	355	72	7	65	25	3	-	25	231	89	10	-
10	ZAP	271	54	2	37	55	6	-	6	100	149	16	-
10	NOR	142	41	-	71	29	-	-	-	101	41	-	-
13	EAST	332	67	5	64	28	3	-	17	212	93	10	-
13	NOR	319	62	5	61	32	2	-	16	195	102	6	-
15	NOR	223	44	2	68	30	-	-	4	152	67	-	-
15	ZAP	370	37	5	46	41	8	-	18	170	152	30	-
17	NOR	420	43	7	63	30	-	-	29	265	126	-	-
17	EAST	382	39	10	64	26	-	-	38	245	99	-	-
20	NOR	258	51	-	73	23	2	2	-	189	59	5	5
20	ZAP	293	57	2	53	33	12	-	6	155	97	35	-
22	NOR	617	62	5	68	21	6	-	31	420	129	37	-
22	EAST	559	56	2	59	34	5	-	11	330	190	28	-
24	NOR	73	21	-	72	14	14	-	-	53	10	10	-
24	STAR	272	56	5	54	30	11	-	13	147	82	30	-
24	ZAP	188	38	5	40	40	13	2	9	75	75	25	4
27	NOR	487	49	8	80	10	2	-	39	390	49	9	-
27	EAST	438	43	5	77	11	7	-	22	337	48	31	-
29	STAR	199	45	4	76	9	9	2	8	151	18	18	4
29	ZAP	377	40	3	55	25	17	-	11	208	94	64	-
29	NOR	43	11	-	64	9	27	-	-	28	4	11	-
31	NOR	809	73	15	77	8	-	-	121	623	65	-	-
31	EAST	283	31	6	72	16	6	-	17	204	45	17	-
August													
3	STAR	131	43	9	82	7	2	-	12	107	9	3	-
3	NOR	476	47	23	64	13	-	-	109	305	62	-	-
3	ZAP	213	38	24	53	21	2	-	51	113	45	4	-
7	ZAP	216	24	4	75	21	-	-	9	162	45	-	-
7	NOR	361	81	10	78	10	2	-	36	282	36	7	-
7	EAST	79	26	11	77	8	4	-	9	61	6	3	-
Total		10,362	1,587						673	6,624	2,564	488	13
August													
14	STAR	129	35	40	49	8	3	-	52	63	10	4	-
17	ZAP	239	68	59	40	1	-	-	141	96	2	-	-
19	NOR	123	[1]21	43	48	-	-	-	53	59	-	-	-
21	EAST	76	56	63	37	-	-	-	48	28	-	-	-
21	STAR	44	13	38	54	8	-	-	17	24	3	-	-
24	ZAP	125	[2]20	70	25	-	-	-	88	31	-	-	-
26	NOR	40	[2]12	75	25	-	-	-	30	10	-	-	-
26	STAR	53	[2]16	69	25	-	-	-	37	13	-	-	-
Total		[3]829	241						466	324	15	4	-
Season total		[3]11,191	1,828						1,139	6,948	2,579	492	13

[1] Includes 2 yearlings.

[2] Includes 1 yearling.

[3] Includes 20 yearlings.

Appendix table 8. --Cumulative age classification of male seals killed on St. George Island, 1 July to 7 August and 14-26 August 1964

Date	Rookery	Estimated number killed from each age class					Total kill	Percent killed from each age class				
		2	3	4	5	6		2	3	4	5	6
1 July	NOR	-	206	156	27	-	389	-	53	40	7	-
6	NOR	-	273	186	34	-	493	-	55	38	7	-
6	ZAP	-	403	397	63	-	863	-	47	46	7	-
8	NOR	6	613	478	79	-	1, 176	-	52	41	7	-
8	EAST	31	844	567	89	-	1, 531	2	55	37	6	-
10	ZAP	37	944	716	105	-	1, 802	2	52	40	6	-
10	NOR	37	1, 045	757	105	-	1, 944	2	54	39	5	-
13	EAST	54	1, 257	850	115	-	2, 276	2	55	38	5	-
13	NOR	70	1, 452	952	121	-	2, 595	2	56	37	5	-
15	NOR	74	1, 604	1, 019	121	-	2, 818	3	57	36	4	-
15	ZAP	92	1, 774	1, 171	151	-	3, 188	3	56	37	4	-
17	NOR	121	2, 039	1, 297	151	-	3, 608	3	57	36	4	-
17	EAST	159	2, 284	1, 396	151	-	3, 990	4	57	35	4	-
20	NOR	159	2, 473	1, 455	156	5	4, 248	4	58	34	4	-
20	ZAP	165	2, 628	1, 552	191	5	4, 541	4	58	34	4	-
22	NOR	196	3, 048	1, 681	228	5	5, 158	4	59	33	4	-
22	EAST	207	3, 378	1, 871	256	5	5, 717	4	59	33	4	-
24	NOR	207	3, 431	1, 881	266	5	5, 790	4	59	32	5	-
24	STAR	220	3, 578	1, 963	296	5	6, 062	4	59	32	5	-
24	ZAP	229	3, 653	2, 038	321	9	6, 250	4	58	33	5	-
27	NOR	268	4, 043	2, 087	330	9	6, 737	4	60	31	5	-
27	EAST	290	4, 380	2, 135	361	9	7, 175	4	61	30	5	-
29	STAR	298	4, 531	2, 153	379	13	7, 374	4	62	29	5	-
29	ZAP	309	4, 739	2, 247	443	13	7, 751	4	61	29	6	-
29	NOR	309	4, 767	2, 251	454	13	7, 794	4	61	29	6	-
31	NOR	430	5, 390	2, 316	454	13	8, 603	5	63	27	5	-
31	EAST	447	5, 594	2, 361	471	13	8, 886	5	63	27	5	-
3 Aug.	STAR	459	5, 701	2, 370	474	13	9, 017	5	63	27	5	-
3	NOR	568	6, 006	2, 432	474	13	9, 493	6	63	26	5	-
3	ZAP	619	6, 119	2, 477	478	13	9, 706	6	63	26	5	-
7	ZAP	628	6, 281	2, 522	478	13	9, 922	6	63	26	5	-
7	NOR	664	6, 563	2, 558	485	13	10, 283	6	64	25	5	-
7	EAST	673	6, 624	2, 564	488	13	10, 362	6	64	25	5	-
14	STAR	725	6, 687	2, 574	492	13	10, 491	7	64	24	5	-
17	ZAP	866	6, 783	2, 576	492	13	10, 730	8	63	24	5	-
19	NOR	919	6, 842	2, 576	492	13	[1] 10, 853	8	63	24	5	-
21	EAST	967	6, 870	2, 576	492	13	[1] 10, 929	9	63	24	4	-
21	STAR	984	6, 894	2, 579	492	13	[1] 10, 973	9	63	24	4	-
24	ZAP	1, 072	6, 925	2, 579	492	13	[2] 11, 098	10	62	23	5	-
26	NOR	1, 102	6, 935	2, 579	492	13	[2] 11, 138	10	62	23	5	-
26	STAR	1, 139	6, 948	2, 579	492	13	[3] 11, 191	10	62	23	5	-

[1] Includes 11 yearlings.

[2] Includes 17 yearlings.

[3] Includes 20 yearlings.

Appendix table 9.--Bull counts, Pribilof Islands, Alaska, 1911-41 and 1943-64

Year	St. Paul Island		St. George Island		Both islands	
	Harem	Idle	Harem	Idle	Harem	Idle
1911	1,090	258	266	71	1,356	329
1912	1,077	93	281	20	1,358	113
1913	1,142	77	261	28	1,403	105
1914	1,316	159	243	13	1,559	172
1915	1,789	546	362	127	2,151	673
1916	2,948	2,278	552	354	3,500	2,632
1917	4,166	2,341	684	365	4,850	2,706
1918	4,610	2,245	734	199	5,344	2,444
1919	4,573	2,158	585	81	5,158	2,239
1920	3,542	1,078	524	83	4,066	1,161
1921	3,443	711	466	36	3,909	747
1922	3,184	493	378	15	3,562	508
1923	3,051	303	361	9	3,412	312
1924	3,127	375	389	15	3,516	390
1925	3,103	283	423	28	3,526	311
1926	3,478	368	556	55	4,034	423
1927	3,916	846	727	126	4,643	972
1928	5,059	1,208	991	241	6,050	1,449
1929	5,998	1,339	1,189	294	7,187	1,633
1930	6,823	1,555	1,489	344	8,312	1,899
1931	7,557	1,519	1,676	369	9,233	1,888
1932	8,268	1,940	1,820	409	10,088	2,349
1933	8,334	1,933	1,879	408	10,213	2,341
1934	8,841	1,860	1,929	422	10,770	2,282
1935	9,444	2,082	2,103	453	11,547	2,535
1936	10,055	2,253	-	-	-	-
1937	10,689	2,516	2,411	515	13,100	3,031
1938	10,720	1,787	-	-	-	-
1939	9,122	2,616	1,858	357	10,980	2,973
1940	9,662	3,968	1,988	571	11,650	4,539
1941	10,089	5,059	1,942	396	12,031	5,455
1943	10,948	3,523	2,107	330	13,055	3,853
1944	11,080	2,539	2,294	450	13,374	2,989
1945	10,750	4,055	2,434	750	13,184	4,805
1946	10,566	3,605	2,430	611	12,996	4,216
1947	10,160	3,331	1,808	479	11,968	3,810
1948	10,386	3,400	1,814	563	12,200	3,963
1949	9,554	2,976	1,746	552	11,300	3,528
1950	9,442	3,152	1,959	574	11,401	3,726
1951	9,434	3,581	1,825	549	11,259	4,130
1952	9,318	4,717	1,983	605	11,301	5,322
1953	9,848	5,912	2,285	826	12,133	6,738
1954	9,906	6,847	2,228	1,311	12,134	8,158
1955	9,034	8,650	2,130	1,902	11,164	10,552
1956	9,384	9,016	-	-	-	-
1957	9,562	10,060	2,423	2,693	11,985	12,753
1958	9,970	9,510	2,619	3,030	12,589	12,540
1959	10,003	11,485	2,527	2,699	12,530	14,184
1960	10,247	10,407	2,552	2,630	12,799	13,037
1961	11,163	11,791	2,843	2,489	14,006	14,280
1962	10,332	9,109	2,342	2,650	12,674	11,759
1963	9,212	7,650	2,071	1,890	11,283	9,540
1964	9,085	7,095	1,989	1,489	11,074	8,584

Appendix table 10.--Age classification of female seals killed on St. Paul Island, 17-28 August 1964

Date	Rookery	Source of females	Number Females killed	Number Tooth sample	Number in each age class of sample 2	3	4	5	6	7	8+	Percent in each age class of sample 2	3	4	5	6	7	8+	Estimated number killed from each age class 2	3	4	5	6	7	8+
August																									
17	NEP	[1]HG	1,030	211	5	38	47	39	36	9	37	2	18	22	19	17	4	18	21	185	227	196	175	41	185
18	NEP	[1]M	1,467	310	6	56	56	79	45	14	54	2	18	18	25	15	5	17	29	264	264	367	220	73	250
19	GOR	M	1,186	244	7	43	53	64	35	8	34	3	18	22	26	14	3	14	36	213	261	308	166	36	166
20	LZ	[1]R	870	196	4	37	49	36	19	9	42	2	19	25	18	10	5	21	17	165	218	157	87	43	183
20	TOL	M	267	36	1	9	11	7	3	-	5	3	25	31	19	8	-	14	8	67	83	51	21	-	37
21	POL	R	368	87	1	14	15	30	17	2	8	1	16	17	35	20	2	9	4	59	62	129	74	7	33
21	POL	HG	139	15	-	-	1	2	3	3	6	-	-	7	13	20	20	40	-	-	10	18	28	28	55
21	NEP	R	166	34	1	4	9	5	9	2	4	3	12	26	15	26	6	12	5	20	43	25	43	10	20
24	NEP	R	609	119	1	25	32	30	18	3	10	1	21	27	25	15	3	8	6	128	165	152	91	18	49
24	NEP	HG	284	62	3	7	12	18	11	2	9	5	11	19	29	18	3	15	14	31	54	82	51	9	43
24	GOR	M	255	61	2	15	17	12	6	-	9	3	24	28	20	10	-	15	8	61	71	51	26	-	38
25	LZ	R	701	140	7	40	27	24	13	6	23	5	29	19	17	9	4	17	35	204	133	119	63	28	119
25	KIT	R	169	32	-	7	7	5	8	1	4	-	22	22	16	25	3	12	-	37	37	27	42	5	21
25	POL	R	59	19	1	7	3	1	2	1	4	5	37	16	5	11	5	21	3	22	9	3	7	3	12
25	POL	HG	85	20	1	2	2	6	8	1	-	5	10	10	30	40	5	-	4	9	9	25	34	4	-
26	NEP	R	656	142	2	30	35	43	14	4	14	1	21	25	30	10	3	10	7	138	164	197	65	20	65
26	LZ	HG	293	67	8	20	14	12	7	-	6	12	30	21	18	10	-	9	35	88	62	53	29	-	26
27	ZAP	R	1,496	311	5	74	74	74	34	16	34	1	24	24	24	11	5	11	15	359	359	359	165	74	165
28	ZAP	R	651	144	5	41	35	31	13	7	12	3	29	24	22	9	5	8	19	189	156	143	59	33	52
Total			[2]10,751	2,250	60	469	499	518	301	88	315								266	2,239	2,387	2,462	1,446	432	1,519

[1] HG = hauling ground; R = rookery; M = mixed.

[2] Plus 1,283 females taken during 1 July to 5 August portion of the male kill.

Appendix table 11.--Cumulative age classification of female seals killed on St. Paul Island, 17-28 August 1964

Date	Rookery	Estimated number killed from each age class 2	3	4	5	6	7	8+	Total kill	Percent killed from each age class 2	3	4	5	6	7	8+
August																
17	NEP	21	185	227	196	175	41	185	1,030	2	18	22	19	17	4	18
18	NEP	50	449	491	563	395	114	435	2,497	2	18	20	23	16	4	17
19	GOR	86	662	752	871	561	150	601	3,683	2	18	21	24	15	4	16
20	LZ	103	827	970	1,028	648	193	784	4,553	2	18	22	23	14	4	17
20	TOL	111	894	1,053	1,079	669	193	821	4,820	2	19	22	22	14	4	17
21	POL	115	953	1,115	1,208	743	200	854	5,188	2	18	22	23	14	4	17
21	POL	115	953	1,125	1,226	771	228	909	5,327	2	18	21	23	15	4	17
21	NEP	120	973	1,168	1,251	814	238	929	5,493	2	18	21	23	15	4	17
24	NEP	126	1,101	1,333	1,403	905	256	978	6,102	2	18	22	23	15	4	16
24	NEP	140	1,132	1,387	1,485	956	265	1,021	6,386	2	18	22	23	15	4	16
24	GOR	148	1,193	1,458	1,536	982	265	1,059	6,641	2	18	22	23	15	4	16
25	LZ	183	1,397	1,591	1,655	1,045	293	1,178	7,342	2	19	22	23	14	4	16
25	KIT	183	1,434	1,628	1,682	1,087	298	1,199	7,511	2	19	22	22	15	4	16
25	POL	186	1,456	1,637	1,685	1,094	301	1,211	7,570	2	19	22	22	15	4	16
25	POL	190	1,465	1,646	1,710	1,128	305	1,211	7,655	2	19	22	22	15	4	16
26	NEP	197	1,603	1,810	1,907	1,193	325	1,276	8,311	2	19	22	23	15	4	15
26	LZ	232	1,691	1,872	1,960	1,222	325	1,302	8,604	2	20	22	23	14	4	15
27	ZAP	247	2,050	2,231	2,319	1,387	399	1,467	10,100	2	20	22	23	14	4	15
28	ZAP	266	2,239	2,387	2,462	1,446	432	1,519	[1]10,751	3	21	22	23	13	4	14

[1] Plus 1,283 females taken during 1 July to 5 August portion of the male kill.

Appendix table 12.--Age classification of female seals killed on St. George Island, 14-26 August 1964

Date	Rookery	Number		Number in each age class of sample							Percent in each age class of sample							Estimated number killed from each age class						
		Females killed	Tooth sample	2	3	4	5	6	7	8+	2	3	4	5	6	7	8+	2	3	4	5	6	7	8+
August																								
14	STAR	286	39	1	8	10	9	6	1	4	3	20	26	23	15	3	10	9	57	74	66	43	9	28
17	ZAP	497	61	-	15	10	24	6	3	3	-	25	16	39	10	5	5	-	124	79	194	50	25	25
19	NOR	728	164	2	52	37	41	17	3	12	1	32	23	25	10	2	7	7	233	167	182	73	15	51
21	STAR	290	62	1	24	14	14	7	-	2	1	39	23	23	11	-	3	3	113	67	67	32	-	8
21	EAST	487	116	4	31	36	33	8	1	3	3	27	31	28	7	1	3	15	131	151	136	34	5	15
24	ZAP	771	169	6	46	44	47	18	4	4	4	27	26	28	11	2	2	31	208	201	216	85	15	15
26	NOR	363	75	2	25	22	18	5	1	2	3	33	29	24	7	1	3	11	120	105	87	25	4	11
26	STAR	429	98	1	29	22	30	8	3	5	1	30	22	31	8	3	5	4	129	94	133	34	13	22
Total		1/3,851	784	17	230	195	216	75	16	35								80	1,115	938	1,081	376	86	175

1/ Plus 567 females taken during 1 July to 7 August portion of male kill.

Appendix table 13.--Cumulative age classification of female seals killed on St. George Island, 14-26 August 1964

Date	Rookery	Estimated number killed from each age class							Total kill	Percent killed from each age class						
		2	3	4	5	6	7	8+		2	3	4	5	6	7	8+
August																
14	STAR	9	57	74	66	43	9	28	286	3	20	26	23	15	3	10
17	ZAP	9	181	153	260	93	34	53	783	1	23	20	33	12	4	7
19	NOR	16	414	320	442	166	49	104	1,511	1	28	21	29	11	3	7
21	STAR	19	527	387	509	198	49	112	1,801	1	29	22	28	11	3	6
21	EAST	34	658	538	645	232	54	127	2,288	1	29	24	28	10	2	6
24	ZAP	65	866	739	861	317	69	142	3,059	2	29	24	28	10	2	5
26	NOR	76	986	844	948	342	73	153	3,422	2	29	25	28	10	2	4
26	STAR	80	1,115	938	1,081	376	86	175	1/3,851	2	29	24	28	10	2	5

1/ Plus 567 females taken during 1 July to 7 August portion of male kill.

Appendix table 14. --Recovery location of tagged male seals killed, by age and rookery, Pribilof Islands, Alaska, 1 July to 7 August 1964

Rookery of tagging	Rookery of recovery: St. Paul Island ZAP-1	TOL	L-K	REEF	POL	NEP	Total	St. George Island ZAP-2	NOR	EAST	STAR	Total	Grand total
O-series - age 2													
ZAP-1	16	1	1	-	1	8	27	-	1	2	-	3	30
TOL	-	7	-	4	1	2	14	2	1	1	-	4	18
L-K	3	-	8	1	-	1	13	-	-	1	-	1	14
REEF	1	1	-	14	5	5	26	4	4	1	-	9	35
POL	-	-	1	2	8	3	14	-	1	-	-	1	15
NEP	2	-	1	-	2	32	37	-	8	3	-	11	48
NOR	1	-	1	-	2	1	5	-	17	4	-	21	26
EAST	-	-	-	-	-	-	-	-	1	4	1	6	6
STAR	-	-	-	-	-	1	1	2	-	1	1	4	5
ZAP-2	1	-	-	3	1	4	9	4	-	2	1	7	16
Tags lost	28	11	6	14	8	38	105	3	9	5	3	20	125
Total	52	20	18	38	28	95	251	15	42	24	6	87	338
N-series - age 3													
ZAP-1	155	23	10	14	12	29	243	7	11	3	1	22	265
TOL	36	63	4	17	6	24	150	7	4	1	1	13	163
L-K	23	2	49	7	5	16	102	-	3	1	-	4	106
REEF	39	12	22	154	9	38	274	10	20	6	1	37	311
POL	7	3	10	13	53	55	141	-	11	5	1	17	158
NEP	27	2	13	12	15	321	390	6	17	5	-	28	418
NOR	8	1	9	10	9	16	53	8	112	17	1	138	191
EAST	2	1	5	4	5	12	29	5	11	39	3	58	87
STAR	2	-	-	3	4	6	15	3	21	11	14	49	64
ZAP-2	3	2	3	6	3	14	31	35	15	7	1	58	89
Tags lost	141	36	50	109	48	225	609	16	43	31	6	96	705
Total	443	145	175	349	169	756	2,037	97	268	126	29	520	2,557
M-series - age 4													
ZAP-1	84	15	-	2	6	22	129	6	5	2	1	14	143
TOL	16	36	-	8	1	5	66	5	2	2	-	9	75
L-K	4	1	24	1	5	11	46	-	1	1	-	2	48
REEF	21	9	5	92	7	11	145	2	3	1	-	6	151
POL	6	1	3	2	26	28	66	2	-	2	-	4	70
NEP	10	1	2	7	3	103	126	2	1	-	-	3	129
NOR	1	-	2	2	-	3	8	2	31	4	-	37	45
EAST	2	-	1	1	-	1	5	2	1	15	1	19	24
STAR	1	-	-	1	1	3	6	1	7	2	3	13	19
ZAP-2	2	-	-	2	1	2	7	24	2	1	-	27	34
Tags lost	82	27	20	67	35	94	325	12	25	22	1	60	385
Total	229	90	57	185	85	283	929	58	78	52	6	194	1,123
L-series - age 5													
ZAP-1	9	2	1	-	-	-	12	-	-	-	-	-	12
TOL	-	2	-	-	-	-	2	-	-	-	-	-	2
L-K	-	-	5	-	-	-	5	-	-	-	-	-	5
REEF	1	2	1	15	1	-	20	-	2	-	-	2	22
POL	-	-	-	-	9	2	11	-	-	-	-	-	11
NEP	-	1	-	-	-	12	13	-	-	-	-	-	13
NOR	-	-	-	-	-	-	-	1	5	1	-	7	7
EAST	1	-	-	-	-	-	1	-	-	-	-	-	1
STAR	-	-	-	-	-	1	1	-	-	-	1	1	2
ZAP-2	-	-	-	-	-	1	1	3	-	-	-	3	4
Tags lost	15	4	5	19	9	25	77	6	9	5	3	23	100
Total	26	11	12	34	19	41	143	10	16	6	4	36	179
K-series - age 6													
ZAP-1	3	1	-	-	-	-	4	-	-	-	-	-	4
TOL	-	3	-	-	-	-	3	-	-	-	-	-	3
REEF	1	1	-	2	1	1	6	-	-	-	-	-	6
POL	-	-	-	-	-	2	2	-	-	-	-	-	2
NEP	-	-	-	-	-	4	4	-	-	-	-	-	4
NOR	-	-	-	-	-	-	-	-	1	-	-	1	1
Tags lost	3	-	-	2	-	1	6	-	1	-	-	1	7
Total	7	5	-	4	1	8	25	-	2	-	-	2	27

Appendix table 15.--Soviet tags recovered from the kill, Pribilof Islands, Alaska, 1964

Date	Tag number	Age	Sex	Island of tagging	Rookery of recovery
		Years			
			St. Paul Island		
16 July	K-16911	2	♂	Bering	POL
27 "	K-15690	2	♂	"	NEP
1 Aug.	K-15698	2	♂	"	NEP
4 "	M-16169	2	♂	Medny	REEF
27 "	M-14147	2	♂	"	ZAP
1 July	K-11427	3	♂	Bering	NEP
7 "	K-14000	3	♂	"	NEP
14 "	K-13854	3	♂	"	ZAP
17 "	E-19848	3	♂	Medny	NEP
27 "	E- 2984	3	♂	"	NEP
27 "	E-20554	3	♂	"	NEP
30 "	E-17248	3	♂	"	LK
5 "	C-25210	4	♂	"	ZAP
6 "	C-62040	4	♂	"	POL
12 "	C-44870	4	♂	"	NEP
18 "	C-63690	4	♂	"	ZAP-REEF
19 "	E-15130	4	♂	Bering	ZAP
22 "	C-43310	4	♂	Medny	NEP
23 "	C-55790	4	♂	"	TOL
23 "	C-67110	4	♂	"	TOL
27 "	E- 2060	4	♂	Bering	NEP
27 "	E-15142	4	♂	"	NEP
1 Aug.	C-87190	4	♂	Medny	NEP
3 "	E-15171	4	♂	Bering	ZAP
17 "	C-51780	4	♂	Medny	NEP
17 "	C-98980	4	♂	"	NEP
17 July	C-18031	5	♂	"	NEP
20 "	C-14479	5	♂	Bering	LK
22 "	C-16211	5	♂	Medny	NEP
27 "	B- 4357	6	♂	Bering	NEP
19 Aug.	M-13487	2	♀	Medny	REEF
19 "	E-17100	3	♀	"	REEF
26 "	C-54750	4	♀	"	ZAP
			St. George Island		
22 July	M-15956	2	♂	Medny	NOR
17 Aug.	M-14590	2	♂	"	ZAP
17 July	E-18754	3	♂	"	EAST
27 "	K-14896	3	♂	Bering	NOR
29 "	K-14192	3	♂	"	STAR
31 "	E-22987	3	♂	Medny	NOR
20 "	C-65890	4	♂	"	ZAP
27 "	E- 4709	4	♂	Bering	EAST
29 "	C-60560	4	♂	Medny	ZAP
29 "	C-61790	4	♂	"	STAR
7 Aug.	C-60240	4	♂	"	NOR
17 "	C-61390	4	♀	"	ZAP
19 "	E-20645	3	-	"	NOR

Appendix table 16.--Record of fur seal pups tagged, Pribilof Islands, Alaska, 1941, 1945, 1947-49, and 1951-64

Year	Series	St. Paul Island	St. George Island	Location of tag	Checkmarks
1941	USA 1-10000;	10,000		Front flipper	Branded, nape of neck
	USA 1-1000 and	1,000		♂♂ right front and hind	Double tagged, branded
	USA 5001-6000	1,000		flippers; ♀♀ left front and hind flippers	nape of neck
1945	10001-11000 (no letter prefix)	973		Left front flipper	None
1947	A 1-20000	19,183		Left front flipper	1/4" hole between 1st and 2nd digits left hind flipper
1948	B 1-19673	19,532		Left front flipper	None
1949	CS 1-20000	19,963		Left hind flipper	None
1951	D 1-1000	1,000		Right hind flipper	1/2 left ear on 100 tagged pups removed
1952	E 1-20000	19,979		Right front flipper	Tip of 1st digit on right hind flipper sliced off
1953	F 1-10000	9,990		Left front flipper	Tip of left front flipper sliced off
	G 7001-7400	398		" " "	" " " " " " "
1954	G 1-7000	7,000		Right front flipper	"V" notch near tip right front flipper
	G 7401-10400	3,000		" " "	" " " " " " "
1955	H 1-10000	49,870		Left front flipper	Tip of 1st digit on left hind flipper sliced off
	10001-50000 (no letter prefix)			" " "	
1956	I 1-10000		9,894	Right front flipper	Tip of right front flipper sliced off
	I 10001-50000	39,900		" " "	" " " " " " "
1957	J 1-10000		9,972	Left front flipper	"V" notch near tip left front flipper
	J 10001-50000	39,870		" " "	" " " " " " "
1958	K 1-10000		9,994	Right front flipper	"V" notch near tip right front flipper
	K 10001-50000	39,923		" " "	" " " " " " "
	K 10001-15000	5,000		Right and left front flippers	Double tagging plus checkmark
1959	L 1-10000		9,980	Left front flipper	Tip of left front flipper sliced off
	L 10001-50000	39,901		" " "	" " " " " " "
1960	M 1-12000		11,992	Right front flipper	Tip of right front flipper sliced off
	M 12001-60000	47,989		" " "	" " " " " " "
1961	N 1-10000		9,988	Left front flipper	"V" notch near tip left front flipper
	N 10001-50000	39,933		" " "	" " " " " " "
1962	O 1-10000		9,980	Right front flipper	"V" notch near tip right front flipper
	O 10001-50000	39,928		" " "	" " " " " " "
1963	P 1-5000		4,993	Left front flipper	Tip of left front flipper sliced off
	P 5001-25000	19,978		" " "	" " " " " " "
1964	Q 1-5000		4,993	Right front flipper	Tip of right front flipper sliced off
	Q 5001-25000	19,998		" " "	" " " " " " "

Appendix table 17.--Dead-pup counts, by rookery, Pribilof Islands, Alaska, 1941 and 1948-64

Rookery	1941	1948[1/]	1949[1/]	1950	1951	1952[1/]	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
St. Paul Island																		
Morjovi	933	20600	2600	3000	3592		3764	8049	5571	10278	4253	2290	4560	6825	5259	4881	2348	1830
Vostochni	7708		12966	13120	18450		19503	25233	14473	20498	12732	7247	7105	11333	10173	8565	5057	3404
Little Polovina	292		1600	1740	2208		2211	3852	2782	4443	1695	975	1597	2427	2415	2121	923	631
Polovina Cliffs	2356			3800	5580	2954	5451	6413	5964	8637	4425	1826	2586	3462	4576	2957	2160	1097
Polovina			1779	5660	6402	3200	5036	6459	4660	7463	5432	2184	3311	5268	2499	1880	1237	783
Ardiguen	42			170	242		189	282	387	364	249	102	141	331	411	225	141	102
Gorbatch	896			2810	3559		3679	4900	4789	6291	3801	1655	2100	3168	3550	1373	2431	1549
Reef	2269			9520	11007		13661	12959	15145	14399	11301	5550	6052	9664	10047	7897	5688	3000
Kitovi	404		800	1160	1517		1695	1669	2610	2892	1588	608	882	2006	2215	2081	881	462
Lukanin			635	770	712		1086	1129	1129	1718	870	324	631	1037	1294	660	546	402
Tolstoi	1623			4230	6033		6154	7552	6489	6789	5659	2823	3691	5237	4761	3004	3274	2614
Little Zapadni	372			2120	2804		2446	4979	3555	4611	2325	1312	1691	4148	3047	2399	2580	1101
Zapadni Reef	171		575	660	353		1116	2278	1383	1674	917	246	608	1472	1291	598	718	425
Zapadni	1284			4660	8204		12221	10424	6607	8650	6415	4045	5009	6450	6329	6627	4614	4172
Counted total	18350			53420	70663		78212	96178	75544	98707	61662	31187	39964	62828	57867	45268	32598	21572
Estimated oversight 5%	918			2671	3533		3911	4809	3777	4935	3083	1559	1998	2946	2893	2263	1630	1079
Total	19268			56091	74196		82123	100987	79321	103642	64745	32746	41962	65774	60760	47531	34228	22651
St. George Island																		
North							3197	3776		6357	3942	1626	2653	3489	3883	2242	2525	792
Zapadni							1272	1453		2742	1569	962	1633	1902	2019	1740	704	446
East							846	1524		2203	1064	616	664	1112	1347	504	502	272
Staraya Artil							3353	2903		3806	2729	1552	1987	2000	2514	1435	1041	767
Counted total							8668	9656		15108	9304	4756	6937	8503	9763	5921	4772	2277
Estimated oversight 5%							433	483		755	465	238	347	425	488	296	239	114
Total							9101	10139		15863	9769	4994	7284	8928	10251	6217	5011	2391

1/ Partial counts

No counts made in years 1942 through 1947.

Appendix table 18.--Tag numbers (Q-series) and weights of live male and female fur seal pups, by rookery, St. Paul Island, 29-30 August 1964

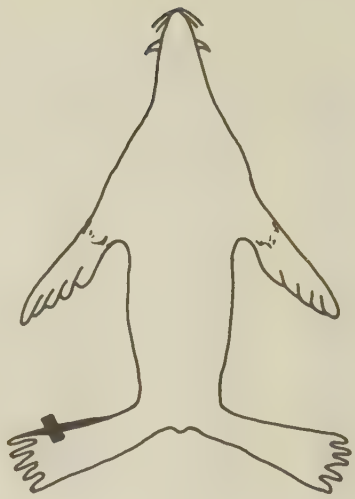
Tag number	Weight Kg.	Tag number	Weight Kg.	Tag number	Weight Kg.	Tag number	Weight Kg.	Tag number	Weight Kg.
				REEF - males					
9028	6.4	9481	5.4	9883	6.6	10858	10.6	11169	7.8
9030	8.0	9513	8.4	9891	3.2	10889	8.6	11174	7.0
9048	8.0	9557	6.4	9913	8.0	10892	7.2	11180	6.2
9058	8.0	9587	8.8	9931	6.6	10984	10.0	11181	8.0
9098	7.0	9667	7.8	9943	6.0	11001	9.8	11186	6.2
9119	6.0	9672	6.6	10143	4.2	11002	4.8	11231	7.4
9120	10.0	9707	4.4	10163	9.8	11006	5.4	11246	9.6
9197	4.6	9708	12.6	10183	9.4	11011	3.6	11264	8.8
9292	8.4	9804	8.4	10228	12.4	11015	8.8	11331	4.4
9318	8.4	9817	9.6	10262	6.8	11028	4.2	11346	5.6
9386	5.6	9824	10.6	10266	10.3	11092	7.6	11365	8.6
9392	6.2	9825	10.4	10278	9.2	11118	5.4	11378	7.4
9401	10.0	9826	11.2	10540	5.4	11158	4.4	11388	4.4
9456	7.4	9834	6.8	10741	10.2	11166	7.4	11400	7.8
9478	3.8	9879	4.4	10753	5.0				
				REEF - females					
not recorded	6.6	9313	7.6	9675	5.6	9939	6.8	11079	8.5
not recorded	6.0	9339	6.4	9703	6.4	9987	3.6	11178	4.6
9012	6.8	9375	3.5	9705	5.2	10128	8.4	11200	6.2
9029	2.8	9382	7.6	9717	6.6	10393	8.8	11243	11.2
9040	6.0	9413	6.2	9813	6.2	10448	9.2	11256	4.2
9064	5.2	9415	7.0	9815	5.8	10492	6.4	11268	7.6
9072	7.0	9423	10.4	9841	4.6	10754	6.2	11281	5.6
9079	6.2	9429	5.6	9872	6.6	10763	8.0	11286	7.0
9081	6.2	9444	7.2	9884	6.6	10881	5.6	11311	9.6
9206	7.0	9450	5.4	9899	5.8	11048	5.4	11324	5.2
9211	8.2	9462	6.4	9903	6.4	11049	9.8	11347	6.8
9231	6.8	9532	10.4	9924	6.8	11052	6.2	11380	6.2
9244	7.0	9533	8.0	9928	8.4	11060	3.6	11396	4.2
9272	5.0	9596	7.8	9934	4.4	11061	7.2	11397	3.2
9284	8.6	9664	6.4	9935	5.8	11062	6.4	not recorded	6.4
9308	6.0								
				ZAPADNI - males					
7322	8.4	7392	5.4	7589	9.4	7736	5.2	8013	6.8
7333	10.4	7394	5.2	7598	5.2	7741	8.8	8017	7.2
7337	7.8	7398	9.6	7604	8.2	7744	8.6	8019	5.8
7339	7.2	7406	7.8	7605	7.0	7745	5.8	8026	7.6
7341	6.4	7415	7.6	7620	8.8	7755	8.8	8027	7.2
7342	6.2	7422	5.8	7624	6.0	7756	9.0	8045	6.6
7346	7.8	7428	9.4	7637	8.2	7772	7.6	8046	8.6
7353	6.6	7462	6.4	7640	8.0	7777	12.0	8055	9.8
7366	10.6	7468	8.2	7645	6.2	7779	8.8	8057	6.8
7369	9.8	7480	6.4	7659	9.4	7792	6.2	8062	8.4
7374	10.2	7493	6.2	7677	7.8	7820	8.8	8066	4.4
7376	5.6	7509	9.4	7703	8.2	7831	7.0	8084	8.6
7378	7.0	7527	7.2	7723	7.6	7872	5.4	8131	7.2
7390	4.6	7547	9.0	7732	5.6	7908	11.6	8135	6.2
7391	8.4	7573	5.4	7735	8.6	7999	6.6	8145	7.0
				ZAPADNI - females					
7301	5.2	7426	4.4	7606	4.4	7763	7.2	7956	6.4
7302	7.2	7431	6.0	7611	4.8	7771	8.6	7987	5.8
7307	4.8	7438	4.8	7625	7.2	7784	7.2	7992	5.2
7325	5.4	7444	7.8	7631	5.2	7793	5.8	8015	5.8
7326	5.4	7464	4.4	7634	7.6	7804	5.6	8022	5.6
7327	8.4	7475	5.8	7652	5.6	7818	4.6	8029	8.4
7330	4.4	7486	3.8	7670	9.6	7824	5.8	8038	4.4
7344	9.6	7488	7.6	7711	5.6	7855	6.6	8056	6.8
7347	5.0	7497	6.2	7716	6.2	7878	6.4	8059	5.2
7348	6.8	7521	5.4	7717	5.4	7882	6.0	8077	6.6
7357	4.8	7526	4.1	7729	5.0	7885	5.6	8108	7.8
7361	4.6	7556	7.2	7740	4.0	7890	7.6	8128	6.6
7382	9.4	7557	10.6	7747	7.8	7904	8.4	8134	7.2
7399	5.8	7560	6.8	7750	7.8	7931	6.6	8146	5.4
7418	5.0	7563	8.4	7758	9.0	7940	5.6	8923	6.2

Appendix table 18.--Tag numbers (Q-series) and weights of live male and female fur seal pups, by rookery, St. Paul Island, 29-30 August 1964--Continued

Tag number	Weight	Tag number	Weight	Tag number	Weight	Tag number	Weight	Tag number	Weight
	Kg.		Kg.		Kg.		Kg.		Kg.
				POLOVINA - males					
13229	7.6	13909	8.2	14136	8.6	14601	7.2	14719	8.2
13391	8.8	13924	13.2	14140	7.8	14616	8.4	14722	8.6
13801	11.4	13925	6.6	14142	8.2	14620	7.8	14736	5.8
13804	5.0	13929	9.8	14171	6.6	14626	5.4	14737	7.5
13818	6.8	13931	6.4	14190	7.4	14632	9.2	14738	7.8
13829	9.0	13937	8.6	14249	8.8	14641	11.8	14740	9.0
13843	8.0	13940	11.6	14264	6.6	14644	9.0	14745	8.4
13847	12.8	13974	10.6	14408	8.4	14661	3.2	14747	10.6
13856	7.6	13979	8.0	14416	6.2	14664	10.2	14756	7.0
13859	9.4	14030	5.6	14420	5.8	14671	7.8	14771	10.0
13883	10.4	14034	6.8	14422	7.4	14672	11.4	14779	10.2
13889	7.6	14064	6.2	14454	7.2	14680	8.6	14781	10.6
13891	8.4	14072	5.2	14480	13.6	14686	8.8	14784	10.0
13895	8.0	14082	9.4	14483	12.4	14694	10.2	14789	5.4
13896	8.2	14109	10.6	14585	10.2	14711	10.4	14791	10.6
13898	8.2								
				POLOVINA - females					
13813	11.2	13922	6.8	14207	6.2	14624	6.4	14704	7.2
13815	8.4	13934	7.6	14243	5.2	14625	5.6	14723	9.4
13817	6.6	13947	7.6	14253	4.4	14637	9.0	14727	9.4
13821	7.6	13973	6.8	14263	7.8	14659	10.0	14729	5.2
13823	7.2	13993	6.0	14266	6.4	14661	6.4	14733	4.2
13844	7.6	14027	4.8	14296	7.2	14662	8.0	14741	7.2
13866	9.4	14040	6.2	14376	7.6	14667	8.6	14749	9.2
13868	7.2	14057	3.6	14391	6.8	14675	7.0	14759	6.6
13873	8.0	14065	8.2	14461	7.2	14676	6.2	14772	7.4
13877	6.2	14074	6.4	14501	6.0	14677	7.8	14777	4.6
13890	6.8	14098	7.6	14547	9.6	14685	6.6	14785	6.2
13893	7.4	14113	6.0	14580	6.2	14689	8.0	14794	8.8
13914	8.2	14115	5.2	14603	7.6	14699	7.4	14798	8.0
13915	10.2	14144	6.8	14618	9.4	14700	7.8	14816	9.8
13918	7.4	14158	7.0						
				NORTHEAST POINT - males					
16535	8.0	16930	4.0	18087	10.4	18287	9.4	18702	7.0
16561	5.2	16934	9.4	18090	8.2	18296	7.4	18708	9.6
16619	9.2	16957	8.4	18093	9.4	18300	7.8	18722	7.0
16643	6.6	16994	11.2	18115	10.4	18311	6.8	18725	9.2
16647	5.6	17060	9.8	18123	8.8	18323	7.2	18758	10.4
16659	9.0	17295	12.4	18149	8.2	18340	8.6	18784	5.6
16678	4.4	17507	9.0	18150	8.4	18343	8.8	18800	7.8
16680	10.0	17531	6.4	18159	7.8	18359	10.2	18810	6.2
16684	9.8	17565	8.2	18206	7.6	18466	8.2	18821	9.0
16693	9.2	17715	8.6	18208	8.8	18525	7.2	18837	8.6
16705	7.6	18004	10.4	18210	10.0	18587	9.2	18853	8.2
16732	7.6	18006	9.8	18244	9.2	18597	8.8	18871	8.0
16849	9.8	18044	9.6	18270	10.8	18640	8.6	18887	12.2
16917	6.6	18048	7.6	18273	12.6	18651	8.6	18897	7.6
16919	6.8	18077	9.8	18274	6.8	18670	6.2	18911	11.0
				NORTHEAST POINT - females					
16514	8.0	16868	7.8	17938	7.8	18365	8.0	18742	7.6
16524	6.0	16871	9.0	17958	9.4	18401	5.6	18746	4.4
16530	6.4	16932	6.4	18009	6.4	18403	7.8	18767	6.4
16568	7.0	16936	9.4	18042	6.8	18418	7.0	18786	7.6
16587	7.8	16962	5.4	18114	5.6	18479	10.0	18796	8.4
16625	8.8	16971	6.4	18134	9.4	18517	10.6	18804	7.2
16642	4.8	16980	4.4	18136	6.2	18523	7.4	18864	4.6
16653	8.8	16992	8.0	18183	4.2	18545	5.8	18866	9.0
16655	7.0	16995	6.8	18216	9.0	18666	5.4	18874	6.0
16700	8.4	17172	7.2	18229	7.4	18676	7.6	18880	9.0
16751	5.6	17250	8.8	18241	7.4	18678	6.8	18891	5.6
16820	8.2	17456	8.6	18303	8.4	18710	7.0	18898	6.4
16829	7.4	17505	7.2	18333	8.6	18717	7.2	18914	9.2
16844	7.0	17637	8.2	18334	8.0	18724	9.2	18919	7.0
16852	5.6	17658	7.2	18335	8.6	18738	8.6	18944	6.4

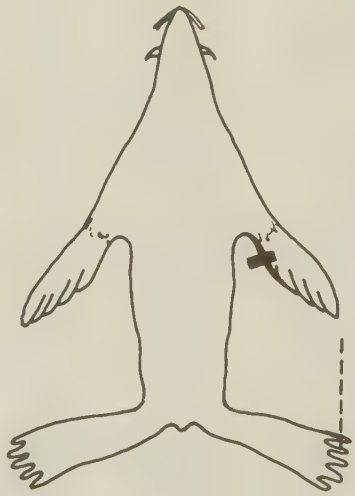
Series: A - 1947
Tag location: left front flipper
Check mark: 1/4" hole in hind left flipper
Number tagged: 19183

Series: B - 1948
Tag location: left front flipper
Check mark: none
Number tagged: 19532

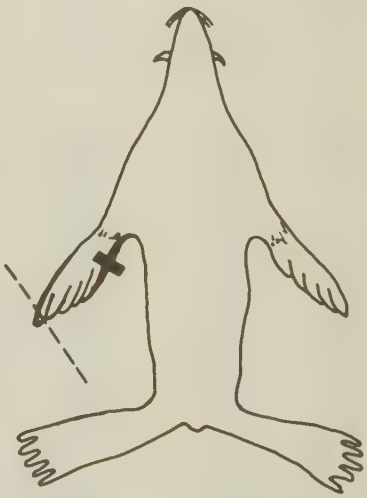


Series: CS - 1949
Tag location: left hind flipper
Check mark: none
Number tagged: 19960

Series: D - 1951
Tag location: right hind flipper
Check mark: none
Number tagged: 1000

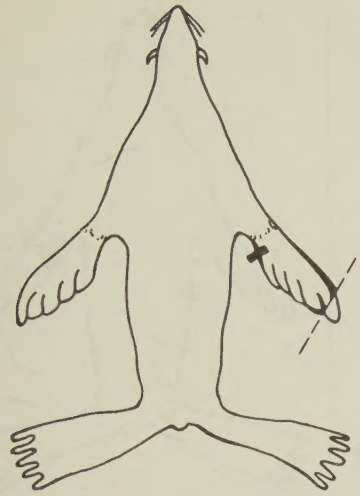


Series: E - 1952
Tag location: right front flipper
Check mark: tip of digit on right hind flipper sliced off
Number tagged: 19979



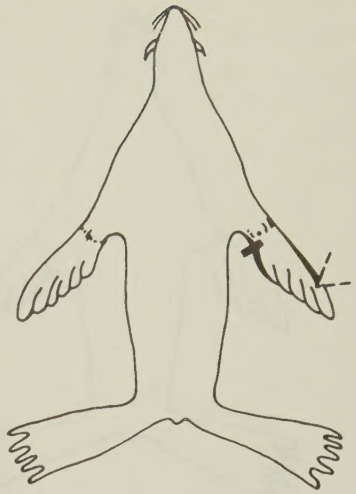
Series: F - 1953
Tag location: left front flipper
Check mark: tip of left front flipper sliced off
Number tagged: 10388
G - 1953 70001-7400

Appendix figure 1.--Tag and checkmark locations, fur seal pup tagging, Pribilof Islands, Alaska, 1947-64.

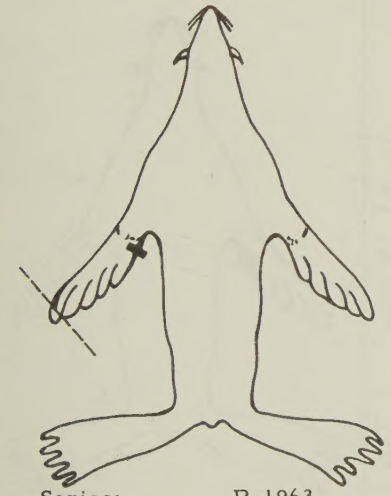


Series: M - 1960
Tag location: right front flipper
Checkmark: tip of right front flipper sliced off
Number tagged: 59981

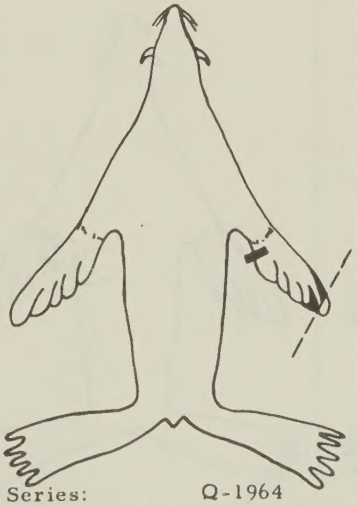
Series: N - 1961
Tag location: left front flipper
Checkmark: "V" notch on left front flipper
Number tagged: 49921



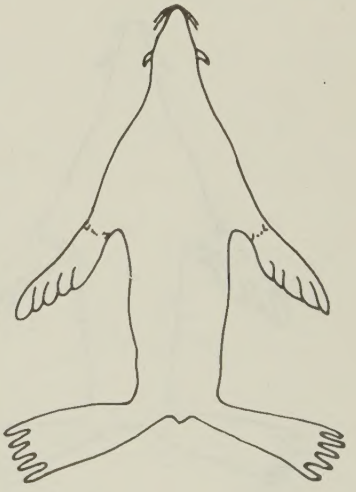
Series: O - 1962
Tag location: right front flipper
Checkmark: "V" notch on right front flipper
Number tagged: 49, 908



Series: P-1963
Tag location: left front flipper
Checkmark: tip of left front flipper sliced off
Number tagged: 24, 971

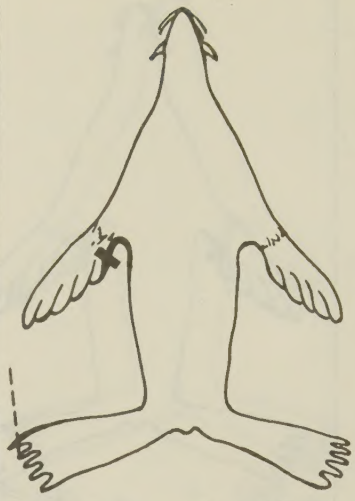


Series: Q-1964
Tag location: right front flipper
Checkmark: tip of right front flipper sliced off
Number tagged: 24, 991

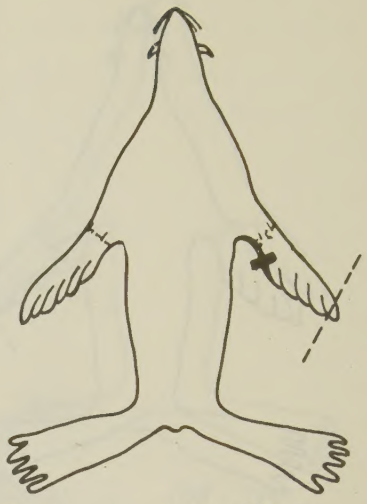


Appendix figure 1. --Tag and checkmark locations, fur seal pup tagging, Pribilof Islands, Alaska, 1947-64.--Continued

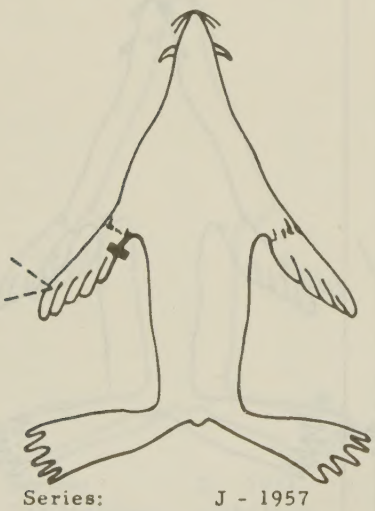
Series: G - 1954
Tag location: right front flipper
Check mark: "V" notch on right front flipper
Number tagged: 10000



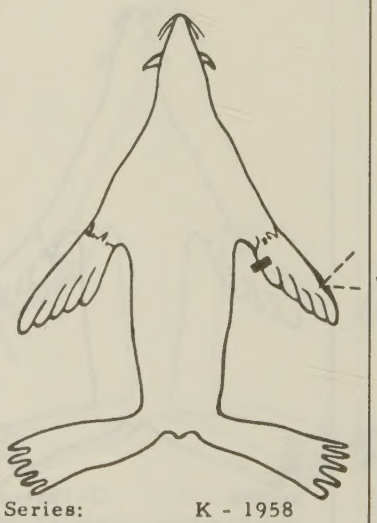
Series: H - 1955
Tag location: left front flipper
Check mark: tip of digit on left hand flipper sliced off
Number tagged: 49870 No letter
H-1955 1-10000 10001-50000



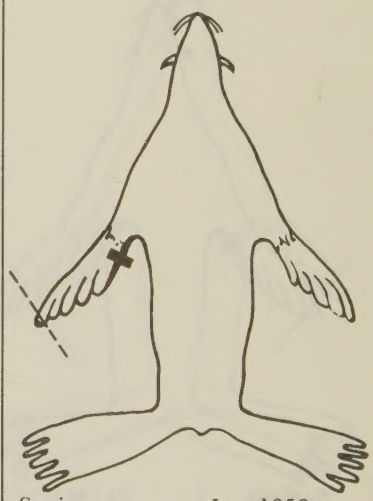
Series: I - 1956
Tag location: right front flipper
Check mark: tip of right front flipper sliced off
Number tagged: 49794



Series: J - 1957
Tag location: left front flipper
Check mark: "V" notch on left front flipper
Number tagged: 49842



Series: K - 1958
Tag location: right front flipper
Check mark: "V" notch on right front flipper
Number tagged: 49917



Series: L - 1959
Tag location: left front flipper
Check mark: tip of left front flipper sliced off
Number tagged: 49881

Appendix figure 1.--Tag and checkmark locations, fur seal pup tagging, Pribilof Islands, Alaska, 1947-64.--Continued

Created in 1849 the Department of the Interior--a department of conservation--is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.

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